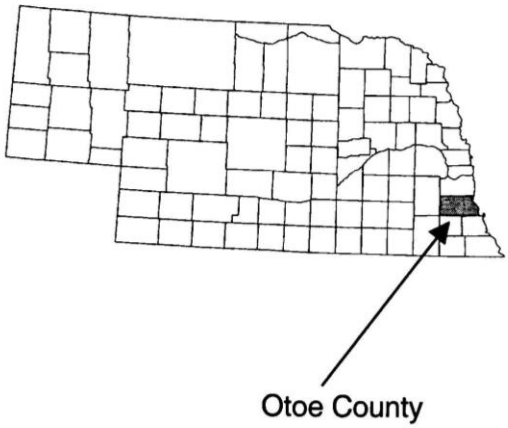
FLOOD INSURANCE STUDY

OTOE COUNTY, NEBRASKA
AND INCORPORATED AREAS

Community Name	Community Number
*Burr, Village of	310161
Douglas, Village of	310162
Dunbar, Village of	310163
Lorton Village, Village of	310504
Nebraska City, City of	310392
Otoe County (Unincorporated Areas)	310462
Otoe, Village of	310164
Palmyra, Village of	310165
Syracuse, City of	310166
Talmage, Village of	310167
Unadilla, Village of	310168

*Non-floodprone community



REVISED:
February 18, 2011

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
31131CV000B

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 10.0.

Initial Countywide FIS Effective Date: August 4, 2004
Revised Countywide Effective Date: February 18, 2011

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FLOOD INSURANCE STUDY
OTOE COUNTY, NEBRASKA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Otoe County, including the Cities of Nebraska City and Syracuse; the Villages of Burr, Douglas, Dunbar, Lorton, Otoe, Palmyra, Talmage and Unadilla, and the unincorporated areas of Otoe County (referred to collectively herein as Otoe County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the Village of Talmage is geographically located in Otoe and Nemaha Counties. The Village of Talmage is included in its entirety in this FIS report. The Village of Avoca is located in Otoe and Cass Counties but is not included in this FIS report. The Village of Avoca is published separately.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Information on the authority and acknowledgements for each of the previously printed FIS reports and FIRMS for communities within the county was compiled and is shown below.

City of Nebraska City:	The hydrologic and hydraulic analyses for this study were performed by Hoskins-Western-Sonderegger, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No.

	EWC-0064. This study was completed in February 1981. The U.S. Army Corps of Engineers (USACE), Omaha District, provided hydrologic and hydraulic information for the Missouri River in this study.
Otoe County (unincorporated areas)	The hydrologic and hydraulic analyses for the Missouri River used in this study were originally performed by the USACE, Omaha District, and presented in a report entitled "Special Flood Hazard Information," completed in September 1979 (Reference 1). "Maps of Floodprone Areas," at a scale of 1:24,000, prepared by the U.S. Geological Survey (USGS), were also used in the preparation of the study (Reference 2).
Village of Talmage:	The hydrologic and hydraulic analyses for this study were performed by Dewild Grant Reckert and Associates Company for FEMA, under Contract No. H-4739. This study was completed in July 1980.

In this countywide study, the Nebraska Department of Natural Resources (DNR) has completed the delineation of approximate (Zone A) flood zones in Otoe County. The mapping was conducted under the guidelines described in the Cooperating Technical Partners (CTP) Interagency Agreement No. 3 between FEMA and the Nebraska DNR, dated July 9, 1999.

There were no previously printed FIS reports for the Villages of Burr, Douglas, Dunbar, Otoe, Palmyra, or Unadilla, or the City of Syracuse.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer (CCO) meeting is to discuss the scope of the FIS report. A final CCO meeting is held to review the results of the study. The dates of the initial and final CCO meetings held for the previous FIS report for Otoe County and the incorporated communities within its boundaries are shown in the following tabulation.

Community Name	Initial CCO Date	Final CCO Date
City of Nebraska	June 5, 1979	October 6, 1981
Otoe County	N/A	April 30, 1997
Village of Talmage	March 21, 1978	June 23, 1981

The initial CCO meetings were held with representatives from FEMA, the communities, and the study contractors to explain the nature and purpose of FIS reports, and to identify the streams to be studied by detailed methods. The final CCO meetings were held with representatives from FEMA, the communities, and the study contractors to review the results of the studies.

The results of this study were reviewed at the final CCO meeting held on April 23, 2002, and attended by representatives of FEMA, the Nebraska DNR, and the community. All problems raised at that meeting have been addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Otoe County, Nebraska, including the incorporated communities listed in Section 1.1.

The following flooding sources were studied by detailed methods for the previous September 16, 1982, FIS report for the City of Nebraska City, and the information has been incorporated into this FIS report: the Missouri River, North Table Creek, South Table Creek, Tributary to South Table Creek, East Tributary to South Table Creek, West Tributary to South Table Creek, Walnut Creek, and Threemile Creek. The areas studied by detailed methods in the previous FIS report were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through February 1986.

The following flooding source was studied by detailed methods for the previous June 1, 1982, FIS report for the Village of Talmage, and the information has been incorporated into this FIS report: the Little Nemaha River from the southern Otoe County boundary to approximately 2.8 miles upstream. The areas studied by detailed methods in the previous FIS report were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through July 1985.

The Missouri River was studied by detailed methods for the previous March 2, 1998, FIS report for Otoe County (unincorporated areas).

Approximate analyses were performed on streams throughout Otoe County to update or establish flood hazard areas for this FIS report.

2.2 Community Description

Otoe County is located in the southeastern portion of Nebraska. It is bordered in Iowa by Fremont County and Atchison County to the east, and in Nebraska by Cass County to the north, Lancaster County to the west, Johnson County to the southwest, and Nemaha County to the southeast.

Otoe County is within the Missouri River basin. The climate of the Missouri River basin ranges from sub-humid in the south and east to semiarid in the west, except for small humid areas in the mountains. In most of the basin upstream of Rulo, Nebraska, the winters are very cold and the summers are relatively hot. Fairly frequent snowstorms occur in winter, usually with a moderate snow accumulation in the plains portion of the basin and a relatively heavy snow accumulation in the mountains. However, the major portion of the annual precipitation over the basin usually results from summer rainfall, with May and June being the wettest months. General rains and thunderstorms with high intensity centers of limited extent are common during the late spring and summer months. Although the area is generally characterized by low annual precipitation, some areas have experienced a number of severe rainstorms in the months of May through September. The U.S. Census Bureau lists the 2000 population of Otoe County as 15,396 (Reference 3).

The climate of Otoe County is characterized by cold winters and hot summers. The average annual precipitation approximates 35 inches, with an average January and July temperature of approximately 24 degrees Fahrenheit (°F) and 77°F, respectively.

2.3 Principal Flood Problems

The Missouri River flows along the eastern boundary of Otoe County, flowing from the north to the south. This river and numerous creeks that flow through the county cause the flood problems in Otoe County.

Historically, the Missouri River in the county is characterized as a meandering stream subject to an extreme variety of discharges ranging from a few hundred cubic feet per second (cfs) in the fall and winter to 100,000 cfs or more in the spring and early summer. The adjacent valley is subject to frequent flooding and erosion damage. The largest flood of record on the Missouri River in Otoe County is the flood of April 1952. This flood had a peak discharge of approximately 414,000 cfs (Reference 4).

Although flooding can occur in any month of the year, there are two main flood periods. The first occurs in March and April when the plains snow pack melts. The second flood period is centered on the month of June when both the mountain snowmelt and the plains rainfall are heaviest. Runoff from the plains snowmelt may occur at a time when there is still ice on the Missouri River; this results in abnormally high stages (Reference 1). Occasionally, large mountain snowmelt runoff coincides

with large plains rainfall runoff; this puts a large amount of flood volume in the reservoirs of dams on the main stem of the Missouri River. In order to evacuate the reservoirs for the next flood, sustained high summer flows are required.

The history of flooding on the Little Nemaha River in Talmage indicates that flooding may occur during any non-winter months. Most floods have been in the spring or early summer as a result of heavy rainfall and/or snowmelt. However, locally heavy thunderstorms in late summer or autumn have also caused flooding problems. The worst flood on the Little Nemaha River during the last century occurred in May 1950. The discharge associated with this flood was estimated at 192,000 cfs by the USGS and at 143,000 cfs by the USACE. High water marks obtained by the USACE show this flood to be approximately 1.5 feet higher in elevation than the 1-percent-annual chance flood, and 1.1 feet lower than the 0.2-percent-annual chance flood (Reference 5).

2.4 Flood Protection Measures

Flood protection measures, such as the construction of six dams on the Missouri River in the Dakotas and Montana, including Fort Peck, Garrison, Oahe, Big Bend, Fort Randall, and Gavins Point; the construction of a navigable channel as far upstream as Sioux City, Iowa; and the construction of levee systems have transformed the Missouri River into a stream with a stable channel and relatively uniform discharges throughout the year. The threat of flooding has been reduced considerably, but not eliminated completely.

The six major dams and reservoirs located on the Missouri main stem are listed in the following table (Reference 1).

Dams	Drainage Area (square miles)	Location	Year Operational
Fort Peck	57,500	Fort Peck, Montana	1940
Garrison	181,400	Riverdale, North Dakota	1955
Oahe	243,500	Pierre, South Dakota	1962
Big Bend	249,300	Fort Thompson, South Dakota	1964
Fort Randall	263,500	Pickstown, South Dakota	1953
Gavins Point	279,500	Yankton, South Dakota	1955

The USACE has constructed two levees in Otoe County to provide flood protection in excess of the 100-year flood event on the Missouri River: Levee Units R-562 and R-573. Levee Units R-562 and R-573 are located from River Mile (RM) 548.9 to RM 541.9 and RM 552.5 to RM 556.8, respectively, along the right overbanks of the Missouri River.

Federal Levee 575 lies on the east bank of the Missouri River, within Fremont County, Iowa. This levee provides protection for the side of the river opposite Nebraska City.

Nonstructural measures of flood protection are being utilized to aid in the prevention of future flood damage for the Village of Talmage. These are in the form of land use regulations adopted from the Code of Federal Regulations that control building within areas that have a high risk of flooding (Reference 6).

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

Information on the methods used to determine peak discharge-frequency relationships for the streams studied by detailed methods is shown below. The methodologies are as follows.

The previous FIS report, dated September 16, 1982, for the City of Nebraska City, considered the Missouri River, Threemile Creek, South Table Creek, the Tributary to South Table Creek, two tributaries to the Tributary to South Table Creek, North Table Creek, and Walnut Creek. The peak discharge-frequency relationships for the Missouri River in the Nebraska City study were based on the Hydrology Report for the Missouri River Agricultural Levee Restudy Program (Reference 7),

prepared by the USACE. The relationships are based on an analysis of historic flood stage and discharges at gauging stations on the main stem of the Missouri River. The relationships reflect the influence of the upstream dams on the river.

In the Otoe County FIS report, dated March 2, 1998, peak discharge-frequency relationships for the ungauged streams studied in detail and by approximate methods were determined by regional regression equations as published in the USGS report, "Magnitude and Frequency of Floods in Nebraska." The ungaged streams studied in detail include Three Mile Creek, South Table Creek, the Tributary to South Table Creek, North Table Creek, and Walnut Creek (Reference 8). The 0.2-percent-annual-chance discharge was determined by extrapolation of the calculated frequency curves. Peak discharges for the Missouri River were taken from the report entitled "Special Flood Hazard Information," published in September 1979 (Reference 1). Five gauging stations on the main stem of the Missouri River, one of them located just downstream from the Interstate Highway 480 Bridge in Omaha, were the principle sources of data for defining these relationships. Stage records and stage discharge records were used. Stage values that were available for each of the gauging stations were converted to discharge values by appropriate rating curves. Representative hydrographs were selected for each of the main stem gauging stations based on the data collected. To develop a frequency-discharge relationship, the reservoir-modified annual flood peaks of the representative hydrographs were plotted in descending order. Best-fit curves were drawn using the plotted points as guides, giving appropriate consideration to the consistency of the reservoir effects.

The previous FIS report, dated June 1, 1982, for the Village of Talmage considered the Little Nemaha River. Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the Village of Talmage.

Stream gauging records are available for the Little Nemaha River at Syracuse (20 years, 212 square miles, USGS No. 06810500) and Auburn (30 years, 793 square miles, USGS No. 06811500). Statistical analyses of the records of these two gages were performed in accordance with the Water Resources Council Bulletin No. 17A (Reference 9). The results of these analyses were compared to flood discharges computed by the Soil Conservation Service (SCS) (Reference 10) for the "Lower Little Nemaha River Watershed Study" at the two gaged sites. For the Auburn gage, the mean and standard deviations computed in this previous study were nearly the same as in the study. These previous computations used the record from 1950-1978 and a regional skew of -.54. This FIS report used the record from 1950 to 1979 and a regional skew of -0.20. The 1-percent-annual-chance discharge was 149,000 cfs for this study. For the Syracuse gage, the computations yielded a 1-percent-annual-chance discharge of 77,000 cfs.

The discharge at Talmage was determined from a graph of discharge versus drainage area on log-log paper using the drainage area at Talmage and a straight line between

the discharges at each gage. Flood discharges were also computed using a USGS report (Reference 8) for comparison to the study of Talmage. The 1-percent-annual-chance discharges that were computed using USGS equations are 47,000 cfs and 100,000 cfs for the Syracuse and Auburn gages, respectively.

Summaries of the peak discharges for all the streams studied by detailed methods are shown in Table 1.

For the approximate analyses performed for this FIS report, peak discharges were calculated using 1993 revised USGS regional regression equations. Parameters for the regional regression equations such as contributing drainage area and channel length were developed from Digital Elevation Model data.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data Table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Hydraulic analyses on the Missouri River were conducted by the USACE, Omaha District, as part of the report titled "Special Flood Hazard Information" (Reference 1). Within the corporate limits of Nebraska City, cross sections and topographic mapping data for the Missouri River were obtained from the USACE using aerial photos at a scale of 1:4,800 (Reference 11). Cross section data within the corporate limits of Otoe County (unincorporated areas) were obtained by photogrammetric methods (References 12, 13, and 14) and topographic maps at a scale of 1:4,800 (References 4 and 15).

Cross section data for North Table Creek, South Table Creek, and Tributary to South Table Creek were taken from available topographic mapping with a scale of 1:2,400 and a contour interval of 5 feet (Reference 16). Cross section data for West Tributary to South Table Creek and for all other study reaches not having available topographic mapping or culverts were field surveyed, which included the measurement of all bridges and structural data.

Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs) 10-percent-annual-chance	2-percent-annual-chance	1-percent-annual-chance	0.2-percent-annual-chance
East Tributary to South Table Creek					
Mouth at Tributary to South Table Creek	1.43	1,310	3,020	4,020	7,100
Little Nemaha River					
At State Highway 67 Bridge	621	51,400	104,000	132,000	211,000
Missouri River					
At Nishnabotna River	*	156,000	213,100	246,300	361,000
At Nebraska City, NE	*	149,800	206,400	236,700	345,400
At Weeping Water Creek	*	149,700	206,300	236,600	345,300
At Watkins Ditch	*	149,600	206,000	236,300	344,700
North Table Creek					
Mouth at the Missouri River	4.64	2,290	4,990	6,580	11,800
Approximately 2,060 feet upstream of 16th Street	3.50	2,110	4,720	6,240	11,500
Upstream of Centennial Avenue	2.58	2,100	4,600	6,020	10,700
Approximately 2,400 feet upstream of Steinhart Park Road	1.66	1,690	3,720	5,170	9,200
Approximately 400 feet downstream of County Road	0.82	1,160	2,610	3,460	6,100
Approximately 3,780 feet downstream of Last County Road					
South Table Creek					
Mouth at Missouri River	14.45	5,220	10,860	14,000	23,500
Upstream of mouth of Tributary to South Table Creek	3.44	1,890	4,260	5,530	10,100
Approximately 2, 400 feet upstream of Steinhart Park Road	2.57	1,820	4,020	5,430	9,800
Approximately at County Road	2.04	1,770	3,910	5,150	9,000
Approximately 2, 260 feet downstream of Last County Road	1.49	1,770	3,830	4,990	8,700
Approximately 500 feet downstream of Last County Road	1.12	1,320	2,850	3,720	6,480
Threemile Creek					
Study beginning	3.01	2,040	4,550	6,000	11,000
Approximately 2,300 feet upstream of County Road	2.18	1,970	4,310	5,640	10,200
Tributary to South Table Creek					
Mouth at South Table Creek	9.10	4,340	9,040	11,640	19,400
Upstream of mouth of East Tributary	6.71	3,980	8,220	10,560	18,000
Upstream of mouth of West Tributary	5.37	3,630	7,440	9,530	16,000
Approximately 3,900 feet upstream of Burlington Northern and Santa Fe Railroad	3.17	3,100	6,340	8,200	13,800
Approximately 2,900 feet downstream of Extraterritorial Limits	2.40	2,340	4,780	6,120	10,420
Walnut Creek					
Mouth at Missouri River	7.65	3,910	8,200	10,590	18,000
West Tributary to South Table Creek					
Mouth at Tributary to South Table Creek	1.16	1,470	3,240	4,250	7,600

- Not available

Cross section data for the backwater analysis of the Little Nemaha River were based on field surveys performed in February 1979. All bridges, dams, and culverts were also field surveyed to obtain elevation data and structural geometry. Valley cross sections were developed by photogrammetric methods utilizing aerial photography flown in April 1979, at an elevation of 4,800 feet above mean terrain (Reference 17). Channel and valley cross sections surveyed for the SCS were also used (Reference 10).

Roughness factors (Manning's "n") used in the hydraulic computations on the Missouri River were determined in the USACE study of the Missouri River (Reference 1). Aerial photos of the Talmage area were used for streams within the Village of Talmage (Reference 17). Roughness factors used in the hydraulic computations for all other streams studied were chosen using engineering judgment based on field observations of the streams and floodplain areas. Table 2 provides roughness coefficients used for each stream studied by detailed methods.

Table 2 - Manning's "n" Values

Stream	Channel "n" Values	Overbank "n" Values
East Tributary to South Table Creek	0.040 – 0.050	0.060 – 0.080
Little Nemaha River	0.027	0.070
Missouri River	0.019 – 0.028	0.035 – 0.190
North Table Creek	0.030 – 0.065	0.030 – 0.100
South Table Creek	0.035 – 0.065	0.025 – 0.110
Threemile Creek	0.040 – 0.045	0.045 – 0.080
Tributary to South Table Creek	0.040 – 0.060	0.055 – 0.080
Walnut Creek	0.060	0.035 – 0.100
West Tributary to South Table Creek	0.045	0.055 – 0.080

Within Nebraska City, starting water surface elevations (WSELs) for the Missouri River were determined from downstream backwater computations. Starting WSELs for the Missouri River within Otoe County were determined by the USACE and are contained in the report entitled "Special Flood Hazard Information" (Reference 1). Starting WSELs for all other streams studied in detail were calculated using the slope-area method.

WSELs of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (Reference 18). Flood profiles were drawn showing computed WSELs for floods of the selected recurrence intervals.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM (Exhibit 2).

For the approximate analyses performed for the FIS report, flood depths were computed using normal depth calculations.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unonbstructed, operate properly, and do not fail.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD and the conversion factor between NGVD and NAVD is +0.34 feet (or NAVD = NGVD + 0.34 feet). These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

For more information on NAVD88, see the FEMA publication entitled Converting the National Flood Insurance Program to the North American Vertical Datum of 1988 (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Silver Spring, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS report provides 1-percent-annual-chance flood elevations and delineations of the 1- and 0.2-percent-annual-chance floodplain boundaries and 1-percent- annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles Floodway Data Table, and Summary of Stillwater

Elevations Table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections within Nebraska City, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 10 feet (Reference 19). In the Village of Talmage, the boundaries were interpolated using aerial photographs (Reference 17) at a scale of 1:4,800 with a 10-foot contour interval superimposed from the 7.5 minute USGS map for Talmage (Reference 20). Within Otoe County (unincorporated areas), the boundaries were interpolated between cross sections using topographic maps at a scale of 1:4,800 with a contour interval of 4 feet (References 4, 12, 13, and 14).

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

Within Nebraska City, the approximate 100-year flood boundaries were delineated, using USGS 7.5-minute topographic quadrangle maps at a scale of 1:24,000 with a 10-foot contour interval (Reference 19). Within Otoe County (unincorporated areas), the boundaries were delineated directly from maps of floodprone areas (Reference 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any

adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS report and on the FIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections (Table 3). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The floodway for the Missouri River determined in the September 16, 1982, Nebraska City FIS report was determined by the USACE using the USACE guidelines for delineation of floodway limits on the Missouri River. These guidelines, established in October 1976, propose that, where a federal levee exists on one side of the River, the levee be used as the one-floodway limit. The other floodway limit is set by allowing a maximum of 1.0 foot increase in flood height, with minimum requirements for floodway width and distance from the channel centerline.

The floodways determined for all other streams studied in detail were computed on the basis of equal conveyance reduction from each side of the flood plain, without backwater considerations. Final adjustments were made in the floodways to insure a smooth and consistent floodway boundary. The results of these computations were tabulated at selected cross sections for each segment for which a floodway was computed.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the WSEL of the 1-percent-annual-chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
East Tributary to South Table Creek								
A	900	84	596	6.7	1,000.2	1,000.2	1,001.0	0.8
B	1,680	99	494	8.1	1,005.0	1,005.0	1,005.3	0.3
C	2,080	161	1,075	3.7	1,006.9	1,006.9	1,007.9	1.0
D	2,480	70	431	9.3	1,007.6	1,007.6	1,008.6	1.0
E	3,260	99	801	5.0	1,013.6	1,013.6	1,014.5	0.9
F	4,150	123	810	5.0	1,018.3	1,018.3	1,019.1	0.8
G	4,840	45	356	11.3	1,021.3	1,021.3	1,022.0	0.7
H	5,660	43	508	7.9	1,027.0	1,027.0	1,027.7	0.7
I	6,640	60	477	8.4	1,031.5	1,031.5	1,032.3	0.8
J	7,190	154	1,022	3.9	1,036.1	1,036.1	1,036.3	0.2

[1]Stream distance in feet above mouth at Tributary to South Table Creek

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

EAST TRIBUTARY TO SOUTH TABLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
Little Nemaha River								
A	1010	4200	32846	4	970.4	970.4	971.2	0.8
B	5,200	4200	29,787	4.4	973.6	973.6	974.4	0.8
C	6,820	3,850	29,585	4.5	975.4	975.4	976.4	1.0
D	8,500	4,000	34,508	3.8	977.6	977.6	978.3	0.7
E	9,060	4000	30,215	4.4	977.6	977.6	978.5	0.9
F	10,150	4000	26,320	5.0	978.3	978.3	979.0	0.7
G	11,430	3950	26,196	5.0	979.5	979.5	980.1	0.6

[1]Stream distance in feet above county boundary

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

LITTLE NEMAHA RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
MISSOURI RIVER								
A	545.08	1,185/5,314	76,521	3.1	914.4	914.4	915.3	0.9
B	545.51	1,664/4,883	66,567	3.6	914.5	914.5	915.4	0.9
C	545.91	1,449/4,546	62,849	3.8	914.9	914.9	915.8	0.9
D	546.32	503/3,589	50,483	4.7	915.1	915.1	916.0	0.9
E	546.72	242/3,501	48,947	4.8	915.5	915.5	916.4	0.9
F	547.12	445/4,088	58,508	4.1	916.1	916.1	917.0	0.9
G	547.52	973/5,020	65,950	3.6	916.5	916.5	917.4	0.9
H	547.93	2,664/6,608	89,456	2.7	916.9	916.9	917.9	1.0
I	548.34	2,542/6,513	81,931	2.9	917.1	917.1	918.1	1.0
J	548.75	2,584/6,031	76,656	3.1	917.4	917.4	918.3	0.9
K	549.16	2,508/5,021	67,061	3.5	917.7	917.7	918.5	0.8
L	549.55	2,909/4,296	60,146	3.9	918.0	918.0	918.9	0.9
M	549.97	2,508/4,169	54,912	4.3	918.3	918.3	919.2	0.9
N	550.36	1,616/4,561	61,296	3.9	918.8	918.8	919.7	0.9
O	550.76	836/4,783	61,641	3.8	919.1	919.1	920.1	1.0
P	551.16	538/5,235	66,590	3.6	919.6	919.6	920.5	0.9
Q	551.57	771/6,179	79,403	3.0	920.2	920.2	921.1	0.9
R	551.97	1,689/7,234	87,688	2.7	920.6	920.6	921.6	1.0
S	552.38	3,225/8,018	94,469	2.5	920.9	920.9	921.9	1.0
T	552.78	4,996/9,722	116,185	2.0	921.3	921.3	922.3	1.0

[1]Miles above confluence with Mississippi River

[2] Width within Otoe County/Total Width

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

MISSOURI RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
MISSOURI RIVER (CONTINUED)								
U	553.18	5,289/8,361	100,288	2.4	921.7	921.7	922.6	0.9
V	553.58	6,120/7,900	91,879	2.6	921.9	921.9	922.8	0.9
W	553.98	6,378/7,803	84,938	2.8	922.2	922.2	923.0	0.8
X	554.39	5,923/8,016	87,165	2.7	922.5	922.5	923.3	0.8
Y	554.80	4,832/8,157	87,202	2.7	922.9	922.9	923.5	0.6
Z	555.20	3,078/7,834	90,065	2.6	923.2	923.2	923.8	0.6
AA	555.60	1,055/6,190	67,078	3.5	923.4	923.4	924.0	0.6
AB	555.81	475/5,406	59,662	4.0	923.6	923.6	924.2	0.6
AC	556.01	600/5,075	56,282	4.2	923.9	923.9	924.4	0.5
AD	556.41	1,661/4,965	61,818	3.8	924.6	924.6	925.1	0.5
AE	556.81	6,023/7,867	88,840	2.7	925.0	925.0	925.5	0.5
AF	557.21	7,928/9,232	106,250	2.2	925.9	925.9	926.3	0.4
AG	557.61	8,260/9,534	117,670	2.0	926.5	926.5	926.8	0.3
AH	558.01	6,983/8,837	104,656	2.3	927.0	927.0	927.2	0.2
AI	558.41	5,719/8,670	93,506	2.5	927.2	927.2	927.5	0.3
AJ	558.81	4,335/6,436	65,875	3.6	927.4	927.4	927.7	0.3
AK	559.22	3,168/4,635	55,157	4.3	927.9	927.9	928.1	0.2

[1]Miles above confluence with Mississippi River

[2] Width within Otoe County/Total Width

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

MISSOURI RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
MISSOURI RIVER (CONTINUED)								
AL	559.62	1,897/3137	39,352	6.0	928.2	928.2	928.4	0.2
AM	559.97	885/2,263	31,070	7.6	928.7	928.7	928.9	0.2
AN	560.37	437/1,781	28,822	8.2	929.3	929.3	929.7	0.4
AO	560.77	495/1,689	31,695	7.5	930.6	930.6	930.9	0.3
AP	561.27	361/1,673	31,529	7.5	931.7	931.7	932.0	0.3
AQ	561.50	429/1,072	24,580	9.6	932.2	932.2	932.5	0.3
AR	561.77	468/2,507	41,244	5.7	933.5	933.5	933.7	0.2
AS	561.97	396/2,946	46,090	5.1	934.2	934.2	934.5	0.3
AT	562.36	362/3,050	49,614	4.8	934.8	934.8	935.1	0.3
AU	562.77	295/2,645	39,585	6.0	935.1	935.1	935.3	0.2
AV	563.17	345/2,467	37,755	6.3	935.8	935.8	935.9	0.1
AW	563.56	401/1,747	34,622	6.8	936.3	936.3	936.4	0.1
AX	563.96	422/2,214	40,801	5.8	936.9	936.9	937.2	0.3
AY	564.37	483/2,882	49,361	4.8	937.4	937.4	937.9	0.5
AZ	564.76	483/3,596	55,990	4.2	937.8	937.8	938.4	0.6
BA	565.16	537/4,326	67,070	3.5	938.3	938.3	938.9	0.6
BB	565.57	351/4,878	71,962	3.3	938.6	938.6	939.2	0.6

[1]Miles above confluence with Mississippi River

[2] Width within Otoe County/Total Width

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
MISSOURI RIVER (CONTINUED)								
BC	565.97	357/5,189	71,262	3.3	938.9	938.9	939.4	0.5
BD	566.37	412/5,378	75,017	3.2	939.1	939.1	939.8	0.7
BE	566.78	446/6,631	90,989	2.6	939.5	939.5	940.2	0.7
BF	567.18	566/7,097	96,467	2.5	939.7	939.7	940.4	0.7
BG	567.58	549/6,723	90,080	2.6	940.0	940.0	940.6	0.6
BH	567.98	444/5,822	71,366	3.3	940.1	940.1	940.8	0.7
BI	568.22	542/5,396	60,814	3.9	940.3	940.3	940.9	0.6
BJ	568.38	578/5,126	61,490	3.8	940.6	940.6	941.1	0.5
BK	568.78	697/4,456	57,165	4.1	940.9	940.9	941.3	0.4
BL	569.18	1,769/4,445	60,319	3.9	941.3	941.3	941.7	0.4
BM	569.58	3,053/4,957	66,517	3.6	941.5	941.5	942.1	0.6
BN	569.99	4,483/6,142	76,941	3.1	941.8	941.8	942.5	0.7
BO	570.38	5,537/6,840	83,333	2.8	942.0	942.0	942.8	0.8
BP	570.79	6,401/7,569	89,204	2.7	942.2	942.2	943.0	0.8
BQ	571.19	6,917/7,981	92,702	2.6	942.3	942.3	943.3	1.0
BR	571.59	1,563/9,176	97,571	2.4	942.5	942.5	943.5	1.0

[1]Miles above confluence with Mississippi River

[2] Width within Otoe County/Total Width

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

MISSOURI RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
North Table Creek								
A	90	65	720	9.1	935.3	930.8[2]	931.4	0.6
B	358	104	1,167	5.6	935.3	934.7[2]	935.3	0.6
C	1,440	130	1,447	4.5	937.8	937.8	938.2	0.4
D	2,370	99	1,213	5.4	939.5	939.5	940.0	0.5
E	2,891	110	1,146	5.7	940.8	940.8	941.4	0.6
F	3,838	87	989	6.7	943.7	943.7	944.0	0.3
G	4,786	133	1,386	4.7	947.1	947.1	947.7	0.6
H	5,326	91	862	7.6	948.1	948.1	948.7	0.6
I	6,361	372	2,977	2.2	950.4	950.4	950.9	0.5
J	7,851	52	668	9.8	960.6	960.6	961.2	0.6
K	9,171	115	1,353	4.9	964.6	964.6	964.9	0.3
L	10,251	137	1,303	4.8	967.1	967.1	967.5	0.4
M	10,871	97	930	6.7	969.1	969.1	969.3	0.2
N	11,831	137	1,225	5.1	973.0	973.0	973.1	0.1
O	12,851	96	963	6.5	976.3	976.3	976.3	0
P	13,801	79	1,091	5.7	979.2	979.2	979.3	0.1
Q	15,631	83	594	10.5	988.1	988.1	988.1	0
R	17,201	97	904	6.9	1000.6	1000.6	1000.8	0.2
S	18,336	438	5,004	1.2	1014.9	1014.9	1015.0	0.1
T	19,356	236	2,307	2.6	1015.0	1015.0	1015.1	0.1
U	20,586	183	1,267	4.7	1015.7	1015.7	1015.9	0.2
V	21,496	98	735	8.2	1018.3	1018.3	1019.0	0.7
W	22,526	92	836	7.2	1025.7	1025.7	1026.1	0.4
X	23,376	167	1,346	4.5	1028.9	1028.9	1029.5	0.6
Y	24,416	391	2,705	1.9	1041.0	1041.0	1041.7	0.7
Z	24,766	238	1,938	2.7	1041.1	1041.1	1041.8	0.7

[1]Stream distance in feet above mouth at the Missouri River

[2] Elevation without considering backwater effects from the Missouri River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

NORTH TABLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
North Table Creek								
AA	25666	91	422	12.2	1044.0	1044.0	1044.1	0.1
AB	26,666	177	1,089	4.7	1053.6	1053.6	1054.6	1.0
AC	27,616	175	980	5.3	1057.9	1057.9	1058.5	0.6
AD	29,066	150	619	5.6	1066.2	1066.2	1066.9	0.7
AE	30,166	109	526	6.6	1076.4	1076.4	1077.0	0.6
AF	31,318	237	1,119	3.1	1093.3	1093.3	1093.4	0.1
AG	31,618	215	820	4.2	1093.8	1093.8	1094.0	0.2
AH	32,668	184	613	5.6	1,101.6	1,101.6	1,102.5	0.9
AI	33,468	119	623	5.6	1,118.3	1,118.3	1,119.3	1.0

[1]Stream distance in feet above mouth at the Missouri River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

NORTH TABLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
South Table Creek								
A	560	163	1997	7	934.0	929.9[2]	930.8	0.9
B	800	105	1,497	9.3	936.0	936.0	936.0	0.0
C	1,460	94	1,392	10.1	937.8	937.8	938.0	0.2
D	1,810	187	2,716	5.2	939.9	939.9	940.9	1.0
E	2,410	150	2,482	5.6	943.8	943.8	944.3	0.5
F	2,980	144	2,866	4.9	944.8	944.8	945.8	1.0
G	3,670	331	4,186	3.3	945.9	945.9	946.8	0.9
H	4,220	390	3,800	3.7	946.3	946.3	947.2	0.9
I	4,910	141	2,061	6.8	946.7	946.7	947.6	0.9
J	6,170	215	2,803	5.0	948.6	948.6	949.5	0.9
K	7,455	307	3,386	4.1	949.2	949.2	950.1	0.9
L	7,925	242	2,651	5.3	949.4	949.4	950.3	0.9
M	8,745	162	2,333	6	953.0	953.0	953.7	0.7
N	8,975	132	1,810	7.7	953.1	953.1	954.0	0.9
O	9,400	147	2,231	6.3	955.5	955.5	956.0	0.5
P	9,670	127	1,909	7.3	955.9	955.9	956.3	0.4
Q	10,030	58	1,324	10.6	957.5	957.5	958.3	0.8
R	11,138	110	1,759	8	960.0	960.0	960.7	0.7
S	12,323	237	2,900	4.8	962.4	962.4	963.1	0.7
T	13,088	198	4,080	1.4	973.3	973.3	974.1	0.8
U	14,110	168	3,162	1.7	979.8	979.8	980.7	0.9
V	14,460	172	3,631	1.5	979.9	979.9	980.8	0.9
W	15,570	288	4,742	1.2	980.0	980.0	980.9	0.9
X	15,835	167	2,068	2.7	981.5	981.5	982.4	0.9
Y	16,105	196	2,699	2	982.3	982.3	983.2	0.9
Z	16,635	260	2,255	2.5	982.5	982.5	983.4	0.9

[1]Stream distance in feet above mouth at the Missouri River

[2] Elevation without considering backwater effects from the Missouri River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH TABLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
South Table Creek								
AA	17025	124	1260	4.4	982.9	982.9	983.6	0.7
AB	17,695	159	1,433	3.9	984.3	984.3	984.9	0.6
AC	18,039	60	895	6.2	984.5	984.5	985.1	0.6
AD	18,639	107	1,368	4.0	985.7	985.7	986.2	0.5
AE	19,219	100	1,115	5.0	986.6	986.6	987.0	0.4
AF	19,969	118	1,092	5.1	988.6	988.6	988.8	0.2
AG	21,399	98	1,003	5.5	995.1	995.1	995.1	0.0
AH	22,539	104	715	7.6	1002.6	1002.6	1002.6	0.0
AI	23,174	82	687	7.9	1007.9	1007.9	1008.1	0.2
AJ	25,114	70	570	9.5	1017.8	1017.8	1018.4	0.6
AK	26,144	90	690	7.9	1021.7	1021.7	1022.0	0.3
AL	27,109	241	414	13.1	1040.5	1040.5	1040.5	0.0
AM	28,109	96	923	5.6	1040.6	1040.6	1040.6	0.0
AN	30,559	86	445	11.6	1050.4	1050.4	1050.4	0.0
AO	31,559	69	536	9.6	1054.6	1054.6	1055.2	0.6
AP	32,559	133	641	7.8	1061.3	1061.3	1061.3	0.0
AQ	33,809	92	842	5.9	1070.5	1070.5	1070.5	0.0
AR	34,882	140	2,254	1.7	1096.9	1096.9	1096.9	0.0
AS	36,032	123	1,076	3.5	1096.9	1096.9	1096.9	0.0
AT	37,732	74	637	5.8	1102.4	1102.4	1102.5	0.1

[1]Stream distance in feet above mouth at the Missouri River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH TABLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
Threemile Creek								
A	3620	174	1208	5	965.0	965.0	966.0	1.0
B	4,960	141	726	8.3	969.5	969.5	970.2	0.7
C	5,800	151	862	7.0	974.3	974.3	975.3	1.0
D	6,160	181	1,769	3.4	981.2	981.2	982.0	0.8
E	7,228	438	4,376	1.4	989.5	989.5	990.3	0.8
F	7,920	163	1,415	4.2	989.5	989.5	990.3	0.8
G	8,900	125	767	7.8	990.7	990.7	991.7	1.0
H	9,800	180	1,297	4.3	996.6	996.6	997.6	1.0
I	10,550	66	482	11.7	998.6	998.6	999.0	0.4
J	11,850	52	375	12.4	1,006.8	1006.8	1,007.4	0.6
K	12,850	58	450	10.4	1,015.3	1015.3	1,015.5	0.2
L	13,480	108	742	6.3	1018.9	1018.9	1019.9	1.0
M	13,760	307	2,761	1.7	1029.3	1029.3	1029.4	0.1
N	13,920	191	2,173	2.1	1029.5	1029.5	1029.6	0.1
O	14,810	107	709	6.6	1029.5	1029.5	1029.6	0.1

[1]Stream distance in feet above mouth at Fourmile Creek

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

THREEMILE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
Tributary to South Table Creek								
A	1560	83	992	11.7	963.1	962.7[2]	963.6	0.9
B	2,740	224	1,639	7.1	969.4	969.4	970.3	0.9
C	2,982	88	959	12.1	970.6	970.6	971.6	1.0
D	3,211	103	1,653	7.0	973.6	973.6	974.4	0.8
E	4,190	77	1,243	9.4	974.9	974.9	975.4	0.5
F	4,900	151	2,027	5.7	977.1	977.1	977.7	0.6
G	5,670	63	889	13.1	980.7	980.7	981.0	0.3
H	6,360	51	732	15.9	984.9	984.9	985.9	1.0
I	6,820	159	1,234	9.4	996.1	996.1	996.1	0.0
J	7,480	316	2,228	5.2	998.5	998.5	999.3	0.8
K	7,980	178	1,374	7.7	999.2	999.2	999.6	0.4
L	8,540	351	2,815	3.8	1003.3	1003.3	1003.9	0.6
M	9,130	274	2,201	4.8	1004.1	1004.1	1004.8	0.7
N	9,430	425	2,503	4.2	1004.7	1004.7	1005.4	0.7
O	9,960	289	1,998	4.8	1006.0	1006.0	1006.6	0.6
P	10,860	125	921	10.3	1008.0	1008.0	1008.4	0.4
Q	12,030	233	1,591	6	1013.0	1013.0	1013.9	0.9
R	12,810	224	1,503	6.3	1016.0	1016.0	1016.7	0.7
S	13,190	151	1,637	5.8	1017.4	1017.4	1018.1	0.7
T	14,030	321	2,625	3.6	1019.2	1019.2	1020.1	0.9
U	15,260	416	3,348	2.8	1021.1	1021.1	1022.1	1.0
V	16,219	69	596	16	1023.1	1023.1	1023.2	0.1
W	15,340	219	2,663	3.6	1029.2	1029.2	1029.2	0.0
X	18,380	114	1,613	5.9	1032.3	1032.3	1032.7	0.4
Y	20,010	90	1,155	8.3	1036.1	1036.1	1036.7	0.6
Z	21,540	72	701	11.6	1044.5	1044.5	1045.1	0.6

[1]Stream distance in feet above mouth at South Table Creek

[2] Elevation without considering backwater effects from South Table Creek

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

TRIBUTARY TO SOUTH TABLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
Tributary to South Table Creek								
AA	22130	115	1059	7.7	1050.2	1050.2	1050.9	0.7
AB	22,690	64	928	8.7	1052.7	1052.7	1053.6	0.9
AC	23,710	65	729	8.4	1056.8	1056.8	1057.7	0.9
AD	24,410	54	680	9.0	1061.2	1061.2	1062.1	0.9
AE	25,210	54	646	9.5	1064.9	1064.9	1065.5	0.6

[1]Stream distance in feet above mouth at South Table Creek

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

TRIBUTARY TO SOUTH TABLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
Walnut Creek								
A	6090	149	803	13.2	938.3	937.3[2]	937.3	0.0
B	7,430	237	2,430	4.4	945.1	945.1	945.2	0.1
C	8,420	223	2,011	5.3	946.9	946.9	947.0	0.1
D	9,600	153	1,272	8.3	951.2	951.2	951.2	0.0
E	10,700	159	1,166	9.1	960.3	960.3	960.3	0.0
F	11,625	148	1,698	6.2	965.2	965.2	965.5	0.3
G	12,647	70	909	11.7	971.2	971.2	972.2	1.0
H	12,853	75	1,008	10.5	978.3	978.3	979.3	1.0
I	13,335	125	1,611	6.6	982.2	982.2	982.7	0.5
J	14,645	110	1,289	8.2	986.4	986.4	987.0	0.6
K	16,755	275	2,597	4.1	992.6	992.6	992.9	0.3
L	18,365	154	9	12.6	1000.1	1000.1	1000.1	0.0

[1]Stream distance in feet above mouth at Missouri River

[2] Elevation without considering backwater effects from Missouri River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

WALNUT CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY	INCREASE
West Tributary to South Table Creek								
A	435	90	543	7.8	1005.1	1004.6[2]	1005.3	0.7
B	750	142	587	6.2	1006.9	1006.9	1007.5	0.6
C	1,130	83	493	8.6	1008.9	1008.9	1009.9	1.0
D	1,700	103	552	7.7	1014.1	1014.1	1014.7	0.6
E	2,140	98	670	6.3	1016.8	1016.8	1017.8	1.0
F	2,710	69	553	7.7	1023.4	1023.4	1024.3	0.9
G	3,330	66	488	8.7	1,026.8	1026.8	1,027.5	0.7
H	3,930	65	456	9.3	1,032.5	1032.5	1,033.1	0.6

[1]Stream distance in feet above mouth at Tributary to South Table Creek

[2] Elevation without considering backwater effects from Tributary to South Table Creek

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOODWAY DATA

WEST TRIBUTARY TO SOUTH TABLE CREEK

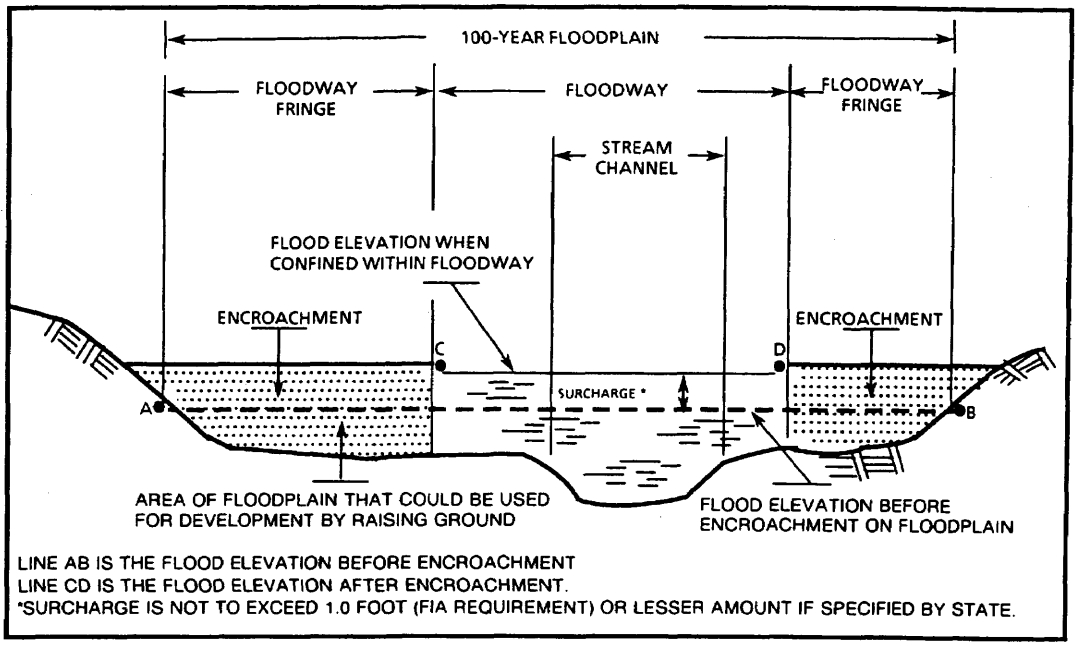


Figure 1 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base (1-percent-annual-chance) Flood Elevations (BFEs) or base flood depths are shown within this zone.

Zone AE

Zone AE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance risk zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of

1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No BFEs or base flood depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance risk zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Otoe County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps, where applicable. Historical data relating to the maps prepared for each community are presented in Table 4.

7.0 OTHER STUDIES

The Omaha District of the USACE published a report entitled "Special Flood Information" for the Missouri River, Gavins Point Dam to Rulo, Nebraska, in September 1979 (Reference 1).

This FIS report either supersedes or is compatible with all previous studies on streams studied in this report and should be considered authoritative for purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Mitigation Division, Federal Office Building, 2323 Grand Boulevard, Suite 900, Kansas City, Missouri 64108-2670.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
*Burr, Village of	December 6, 1974	None	None	None
Douglas, Village of	November 29, 1974	None	None	None
Dunbar, Village of	September 6, 1974	April 9, 1976	August 19, 1985	None
Lorton, Village of	None	None	None	None
Nebraska City, City of	March 25, 1977	None	September 16, 1982	None
Otoe County (Unincorporated Areas)	March 2, 1998	None	March 2, 1998	None
Otoe, Village of	March 25, 1975	None	August 19, 1985	None
Palmyra, Village of	December 26, 1975	None	None	None
Syracuse, City of	December 7, 1973	None	July 1, 1988	None
Talmage, Village of	September 13, 1974	None	June 1, 1982	None
Unadilla, Village of	August 23, 1974	November 14, 1975	September 4, 1985	None

*Non-floodprone

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

9.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Army Corps of Engineers, Omaha District, "Special Flood Hazard Information", Gavins Point Dam to Rulo, Nebraska, Volume III, River Miles 581.8-498.0, September 1979.

2. U.S. Geological Survey, Maps of Flood-Prone Areas, Scale 1:24,000, Cook, Dunbar, Nehawka, Palmyra, Paul, Syracuse, Talmage, and Unadilla.

3. 2000 U.S. Census: Otoe County, Nebraska. Retrieved on October 20, 2001, from http://quickfacts.census.gov/qfd/.

4. U.S. Army Corps of Engineers, Topographic Mapping, Scale 1:4,800, Contour Interval 5 feet: Missouri River, February 1974.

5. U.S. Army Corps of Engineers, Omaha District, Unpublished Data for Gaging Station on Little Nemaha River near Talmage, Nebraska, November 1950 to March 1968.

6. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Code of Federal Regulations, Title 24, Chapter 10, Parts 1910, 3A & 3B, Federal Register, Vol. 41, No. 207, Revision 1976.

7. U.S. Army Corps of Engineers, Missouri River Agricultural Levee Restudy Program, Hydrology Report, March 1962.

8. U.S. Geological Survey, Open File Report, Magnitude and Frequency of Floods in Nebraska, Water-Resources Investigations 76-109, Emil W. Beckman, Lincoln, Nebraska, October 1976.

9. U.S. Water Resources Council, Bulletin No. 17A, Hydrology Committee, Guidelines for Determining Flood Flow Frequency, June 1977.

10. U.S. Department of Agriculture, Soil Conservation Service, Lower Little Nemaha Watershed Study, Lincoln, Nebraska (in progress).

11. Hoskins-Western-Sonderegger, Aerial Photography, Scale 1:4,800, Missouri River, February 1974.

12. Garber and Work, Topographic Mapping, Scale 1:2,400, Contour Interval 5 feet: Nebraska City, 1968.

13. U.S. Army Corps of Engineers, Omaha District, Aerial Photography, Scale 1:4,800, Missouri River, River Miles 581.8-550.0, February 1974.

14. U.S. Army Corps of Engineers, Aerial Photographs, Scale 1:4,800, Missouri River, River Miles 550.0-530.3, March 1974.

15. U.S. Army Corps of Engineers, Aerial Photographs, Scale 1:4,800, Missouri River, River Miles 530.0-498.0, June 1974.

16. U. S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24,000, Contour Intervals 10 and 20 feet: Avoca, Burr, Cook, Douglas, Dunbar, Eagle, Elmwood, Julian, McPaul, Nebraska City, Nebraska City NW, Nebraska-Iowa, Nehawka, Palmyra, Paul, Syracuse, Talmage, Undilla and Weeping.

17. M.J. Harden Associates, Aerial Photographs for Talmage, Nebraska, Kansas City, Missouri, Scale 1:4,800, Contour Interval 10 feet: April 1979.

18. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Users Manual, October 1973, Supplement, January 1977.

19. U.S. Geological Survey, 7.5 Minute Series (Topographic) maps: Nebraska City, Iowa-Nebraska, 1966; Nebraska City NW, Nebraska-Iowa, 1966.

20. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 feet: Village of Talmage, Nebraska, 1966.

21. U.S. Department of the Army, Corps of Engineers, Rock Island District. *Upper Mississippi River System Flow Frequency Study Main Report*. January 2004. http://www.mvr.usace.army.mil/pdw/pdf/FlowFrequency/Documents/FinalReport/default.asp

22. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center. *UNET, One-Dimensional Unsteady Flow through a Full Network of Open Channels, User's Manual*. Davis, California, 1997.

23. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center. *HEC-RAS River Analysis System*, Version 3.1.3. Davis, California, May 2005.

24. Earthdata International of Maryland, LLC. "Mississippi River DEM/DTM Project", Gaithersburg, Maryland. Data collection in 1995 & 1998.

10.0 REVISION DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original FIS was printed. Future revisions may be made that do not result in the republishing of the FIS report. To assure that user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data.

10.1 First Revision (February 18, 2011)

Authority and Acknowledgments

The hydrologic and hydraulic analyses for the Missouri River were performed by the US Army Corps of Engineers as part of the Upper Mississippi River System Flow Frequency Study (UMRSFFS). This study was a collaboration of effort between the Rock Island, St. Louis, Kansas City, Omaha, and St. Paul districts and was completed in 2003. The 1-percent-annual-chance flood water surface profile and floodway computations on the Missouri River were performed within HEC-RAS for the Federal Emergency Management Agency (FEMA) under Interagency Agreement No. HSFE07-06-X-0012 by the Kansas City and Omaha districts and were completed in 2007.

The floodplain mapping for the Missouri River was performed by Watershed Concepts for FEMA under Contract No. HSFE07-07-C-0022.

Coordination

The results of this study were reviewed at the final CCO meeting held on November 13, 2009, and was attended by representatives of FEMA, Otoe County, Nebraska City and the Nebraska Department of Natural Resources. All issues raised at that meeting have been addressed.

Hydrologic Analyses

Major Upper Mississippi River Basin flooding during the 1990s resulted in significant losses, as well as raised questions regarding the frequency of the associated flood events. Reevaluation of the Upper Mississippi River System became necessary to address the questions resulting from the Great Flood of 1993, and was facilitated based on the availability of new topographic data, new computational techniques, and about 20 more years of recorded hydrologic data since the previous study of the Mississippi River had been performed in 1979. This is generally true for the Missouri River as well. The last major effort to comprehensively determine Missouri River flow frequencies was in 1962. The additional record of more than 35 years included the major events of 1993 downstream of Nebraska City and the 1997 large volume flood in the upper reaches of the Missouri River.

The Upper Mississippi River System Flow Frequency Study (UMRSFFS) was undertaken starting in 1998 with the purpose to update the discharge-frequency relationships and associated water-surface profiles for the Mississippi River from St. Paul, Minnesota to the confluence of the Ohio River; for the Illinois River from Lockport, Illinois to its mouth; and for the Missouri River from Gavins Point Dam to its mouth. Five US Army Corps of Engineers Districts participated in the study: Rock Island, St. Louis, St. Paul, Kansas City, and Omaha. The study was completed in 2003.

The hydrologic analysis for the UMRSFFS utilized a combination of the following methods and approaches to determine discharge-frequency relationships: 100 years of record from 1898 to 1998; the log-Pearson Type III distribution for unregulated flows at gages; main stem flows between gages determined by interpolation of the mean and standard deviation for the annual flow distribution based on drainage area in conjunction with a regional skew; flood

control reservoir impacts defined by developing regulated versus non-regulated relationships for discharges; extreme events determined by factoring up major historic events; HEC-HMS and/or HEC-1 models for the main tributaries; and the UNET unsteady flow program to address hydraulic impacts. In situations where historic records were not adequate or appropriate to develop discharge-frequency relationships or to verify the results, hydrologic modeling was used to create synthetic flows based on rainfall. Gage records for all streams were carefully evaluated.

The computation of unregulated flow frequency relationships on the Missouri River upstream of the Kansas River required special consideration due to the combination of the two historic peak flow periods consisting of the plains snowmelt of the early spring and the mountain snowmelt and plains rainfall of the late spring/early summer. An additional concern related to the Missouri River was flow depletion due to irrigation and reservoir evaporation. Historic depletions were added to the observed flow record to help obtain unregulated flows, while historic depletions were adjusted to present level depletions for computation of the regulated flow record.

The result of the hydrologic aspects of the study was a discharge and related frequency of occurrence for stations or given cross section located along each of the principle main stem rivers. For more detailed information on each of the hydrologic methodologies used to determine discharges, the reader is encouraged to consult the report cited as Reference 21 in Section 9.0 of this FIS.

A summary of the peak discharges calculated for this study is shown in Table 1.

Hydraulic Analyses

The main hydraulic tool used to determine flood elevations along the Missouri River was the UNET unsteady flow computer modeling program (Reference 22). Included in the UNET model were the main stem of the Mississippi River, several of its main tributaries, navigation dams, and the levees and levee systems. Hydrographic surveys were assembled from navigation channel maintenance surveys, dam periodic inspection surveys, and environment management project surveys. These surveys date from 1997 or later. For areas where no digital hydrographic surveys were available, such as in some side channels and chutes, depths were estimated from the most current printed surveys available. Bluff-to-bluff digital terrain data collected in 1995 and 1998 were used to supplement the channel survey data (Reference 24). Model development consisted of constructing HEC-RAS models from the original cross-sections, adding in ineffective flow areas or obstructions as necessary, and then converting the models to UNET.

The UNET model was calibrated to reproduce recorded flood hydrographs for a selected period of record. The UNET model was calibrated to both stage and discharge at gaging locations primarily by adjusting roughness coefficients and estimated lateral inflows. Annual peak flows and peak stages from the period of record run of the calibrated UNET model were used to develop rating curves for each cross section location. Using these station rating curves and the station frequency flows developed during the hydrology phase, frequency elevation points were obtained for each cross section location. Connecting the corresponding points resulted in flood frequency profiles. These profiles were coordinated among the computational teams and appropriate adjustments were made to assure consistency.

Some special considerations and techniques were required to address especially complex flow reaches. The confluences of the Missouri and Illinois Rivers with the Mississippi relied

primarily on development of graphical stage-probability relationships for backwater-impacted cross sections. These were created using a graphical Weibull approach. The graphical period-of-record stage-probability curves were combined to blend a consistent and reasonable profile for each probability flood. Confluences of many other smaller streams with the main stem also exhibited backwater effects resulting in discontinuities in the profiles. A computer routine was developed to smooth the profile in these reaches so as to form a consistent, reasonable transition through the zone of backwater.

The 1-percent-annual-chance water surface elevation profile was calculated using the HEC-RAS 3.1.3 computer program (Reference 23). Upon completion of the Upper Mississippi River System Flow Frequency Study (UMRSFFS), FEMA funded the Corps of Engineers to compute a floodway for the studied reach of the Missouri River. This floodway determination consisted of converting the hydraulic data from UNET to HEC-RAS, calibrating the HEC-RAS steady-state models to the UMRSFFS results for the 1-percent-annual-chance profile, and performing the floodway computations. The 1-percent-annual-chance elevations from this calibrated HEC-RAS model were used as the basis to delineate the associated 1-percent-annual-chance floodplain and correspond to the base flood elevation shown on the maps. The 10-, 2-, and 0.2-percent-annual-chance elevations shown on the flood profiles were plotted using the original UNET elevations.

The following Manning's n numbers were used for this study.

FLOODING SOURCE	CHANNEL "n"	OVERBANK "n"
MISSOURI RIVER	0.017 – 0.10	0.22 – 0.99

For more detailed information on each of the hydraulic methodologies used to calculate flood elevation profiles, the reader is encouraged to consult the report cited as Reference 21 in Section 9.0 of this FIS.

Vertical Datum

The studied reach of Missouri River spans multiple counties in multiple states, and the river forms the actual border between adjacent counties. The Upper Mississippi River System Flow Frequency Study (UMRSFFS) was originally performed using the NGVD29 vertical datum. Applying an average countywide datum shift to convert to NAVD88 would have resulted in a mismatch of elevations between counties. Therefore, in order to perform the most accurate vertical datum conversion possible, and to maintain consistency in approach across county lines, the datum conversion for the Missouri River was performed on a cross-section by cross-section basis, rather than by applying an average county-wide or stream-wide value. For cross sections located in the Otoe County the range of conversion factors was +0.31 feet to +0.37 feet.

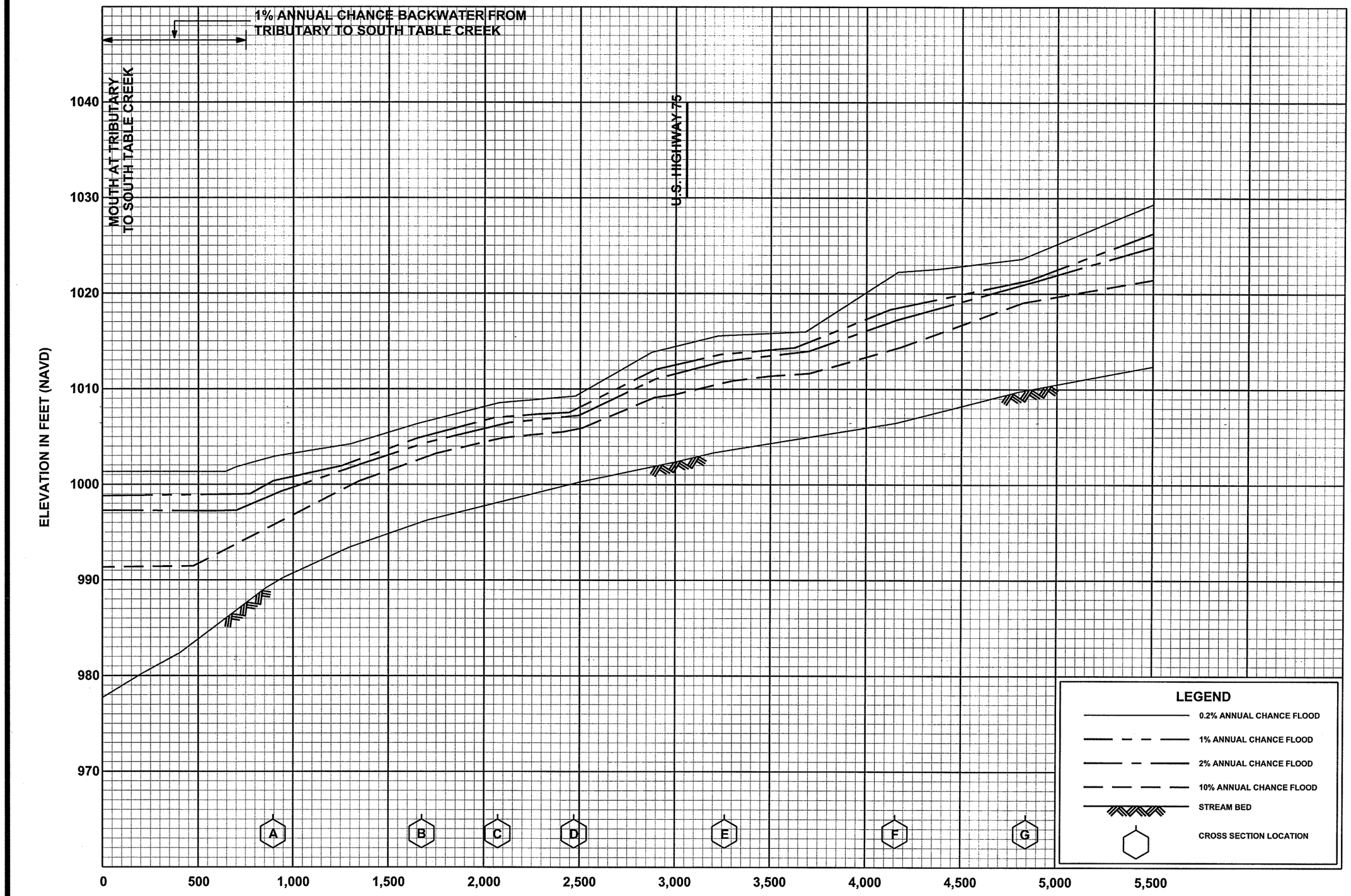
Floodplain Boundaries

Between cross sections along the Missouri River, the boundaries were interpolated using a digital terrain model (DTM) created from photogrammetric-derived mass points and break lines, with a post spacing of 15 feet and vertically accurate enough to support the creation of 4 foot contours (Reference 24).

Floodways

Upon completion of the Upper Mississippi River System Flow Frequency Study (UMRSFFS), FEMA funded the Corps of Engineers to compute a floodway for the studied reach of the

Missouri River. This floodway determination consisted of converting the hydraulic data from UNET to HEC-RAS, calibrating the HEC-RAS steady-state models to the UMRSFFS results, and performing the floodway computations.



FLOOD PROFILES

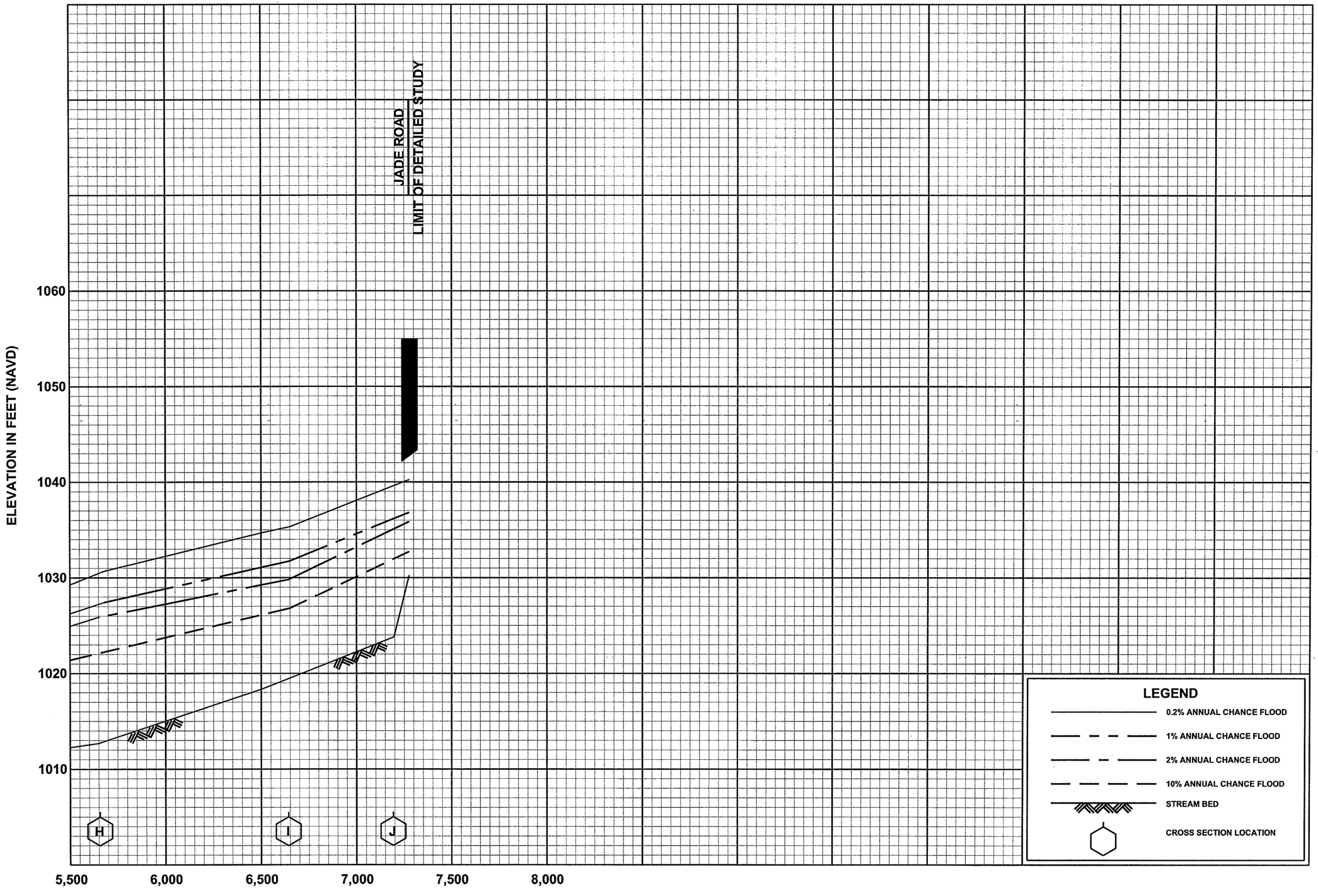
EAST TRIBUTARY TO SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

01P



FLOOD PROFILES

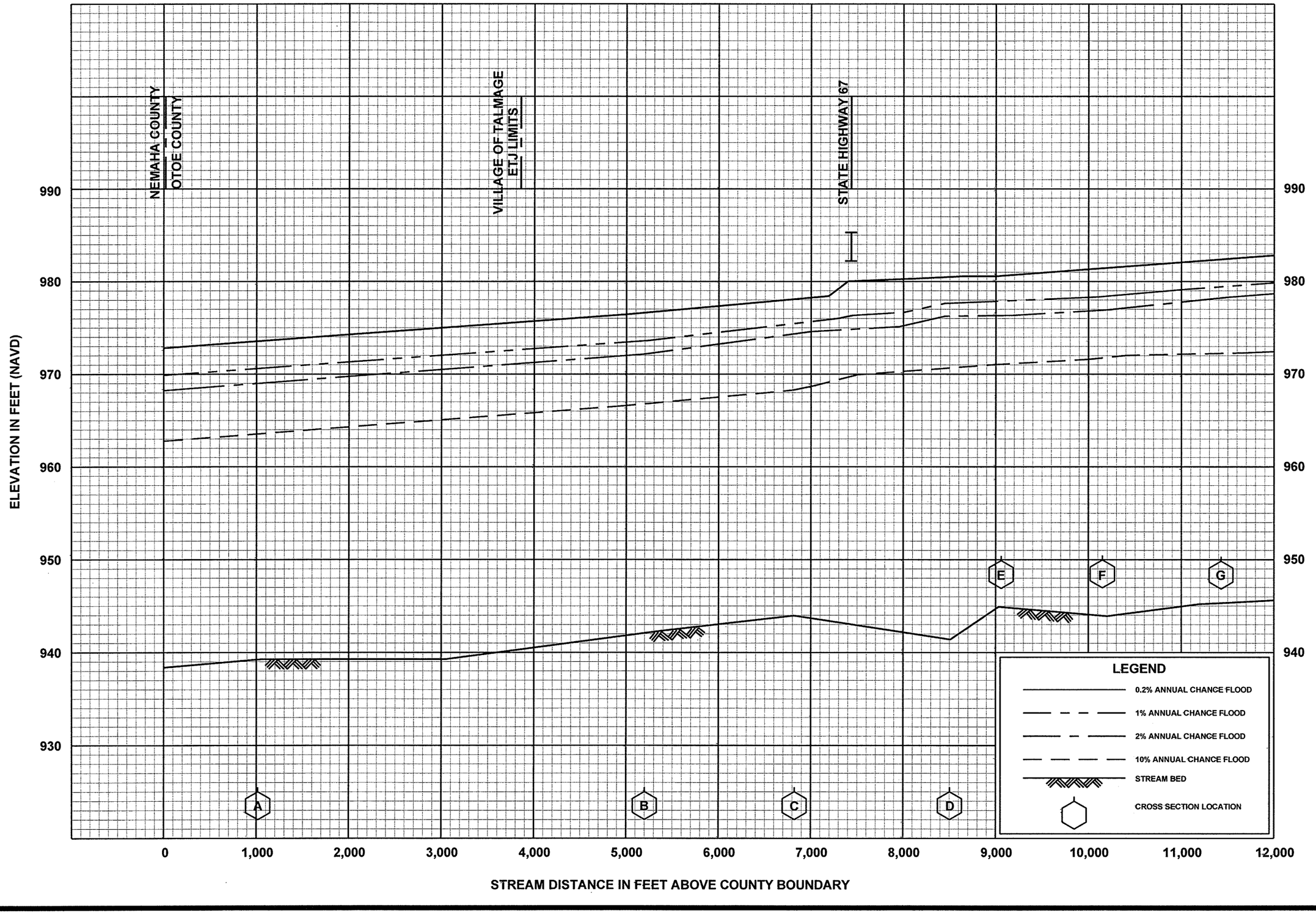
EAST TRIBUTARY TO SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

02P



FLOOD PROFILES

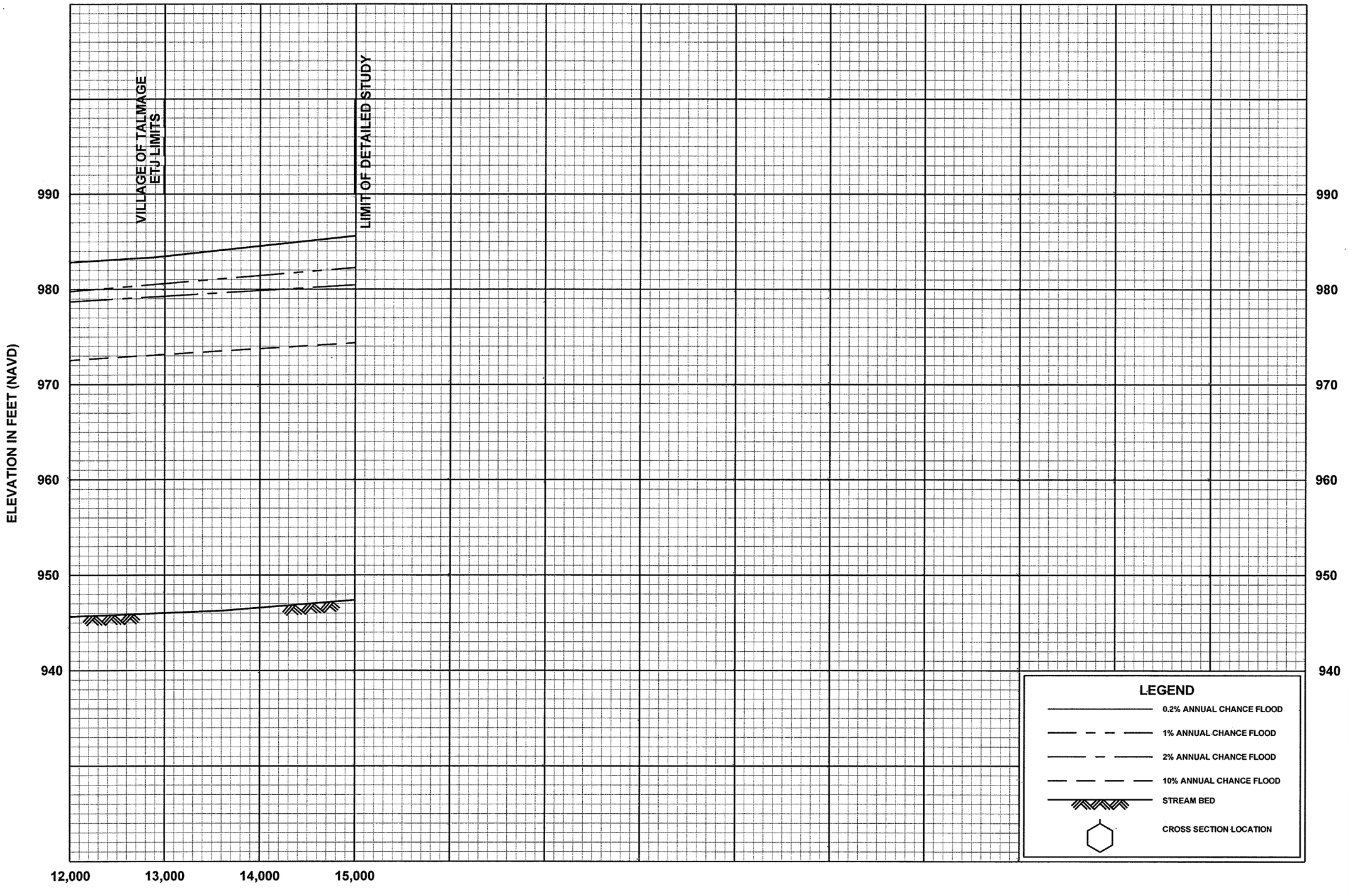
LITTLE NEMAHA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

03P



FLOOD PROFILES

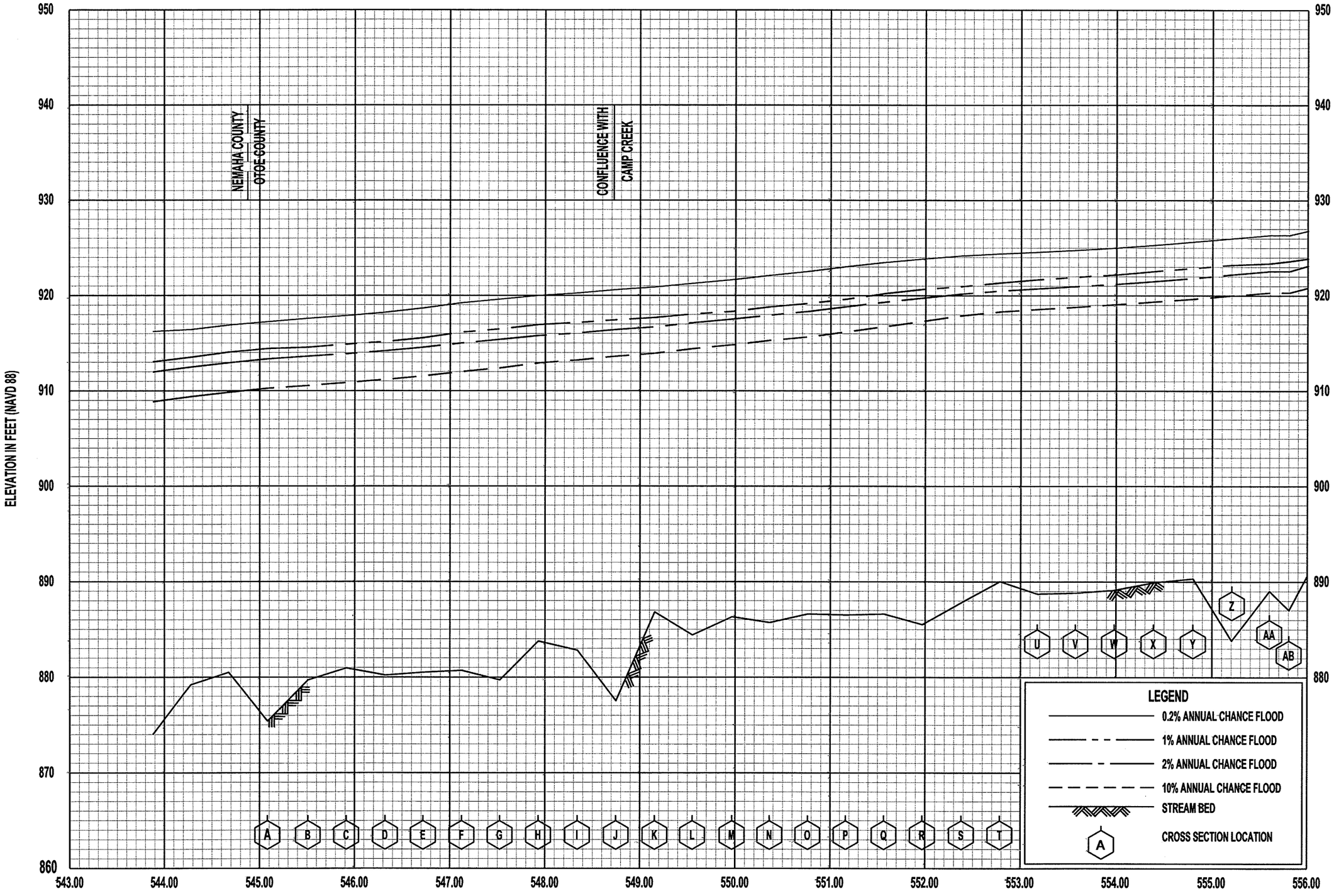
LITTLE NEMAHA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

04P



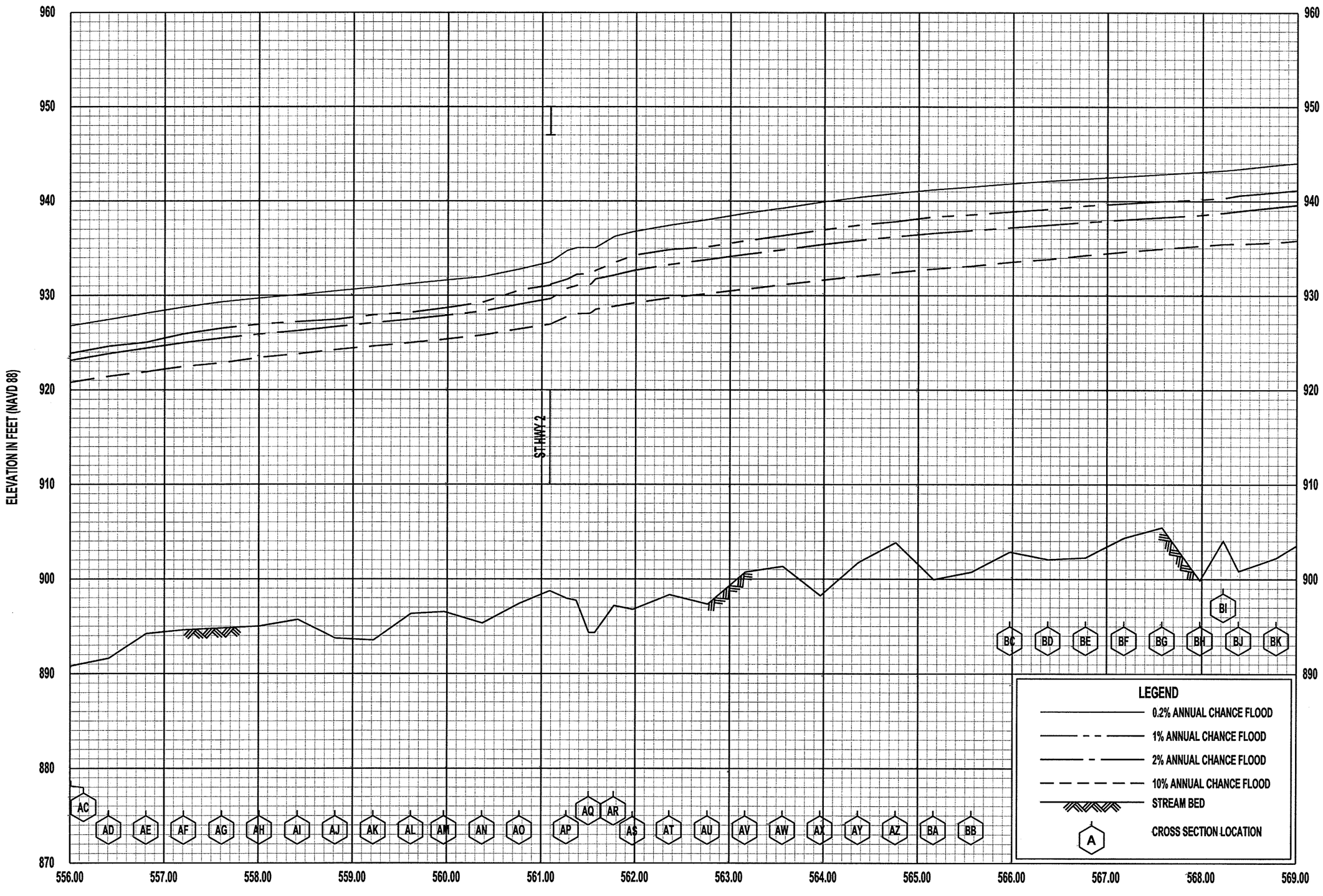
FLOOD PROFILES

MISSOURI RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE
AND INCORPORATED AREAS

05P



FLOOD PROFILES

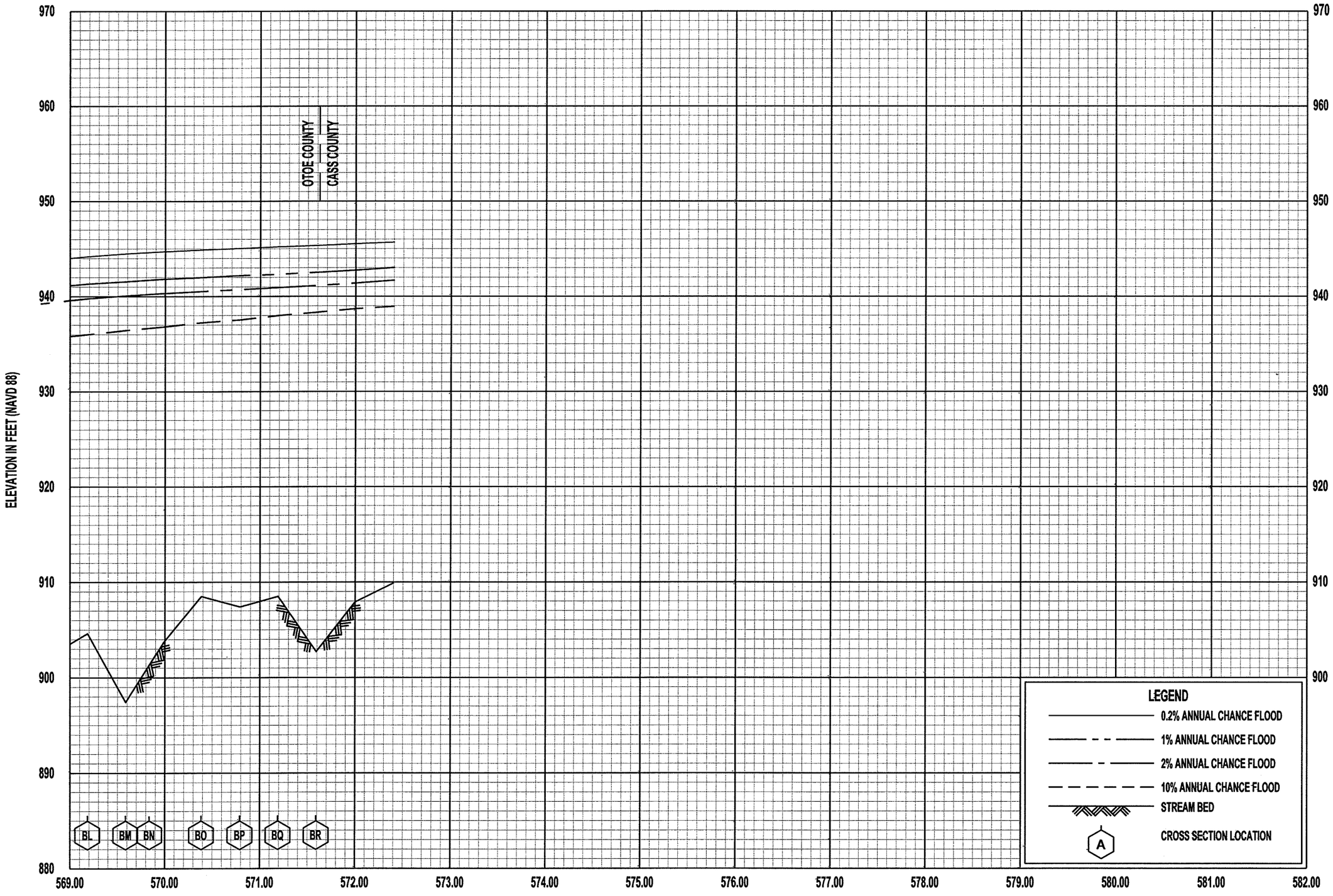
MISSOURI RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

06P



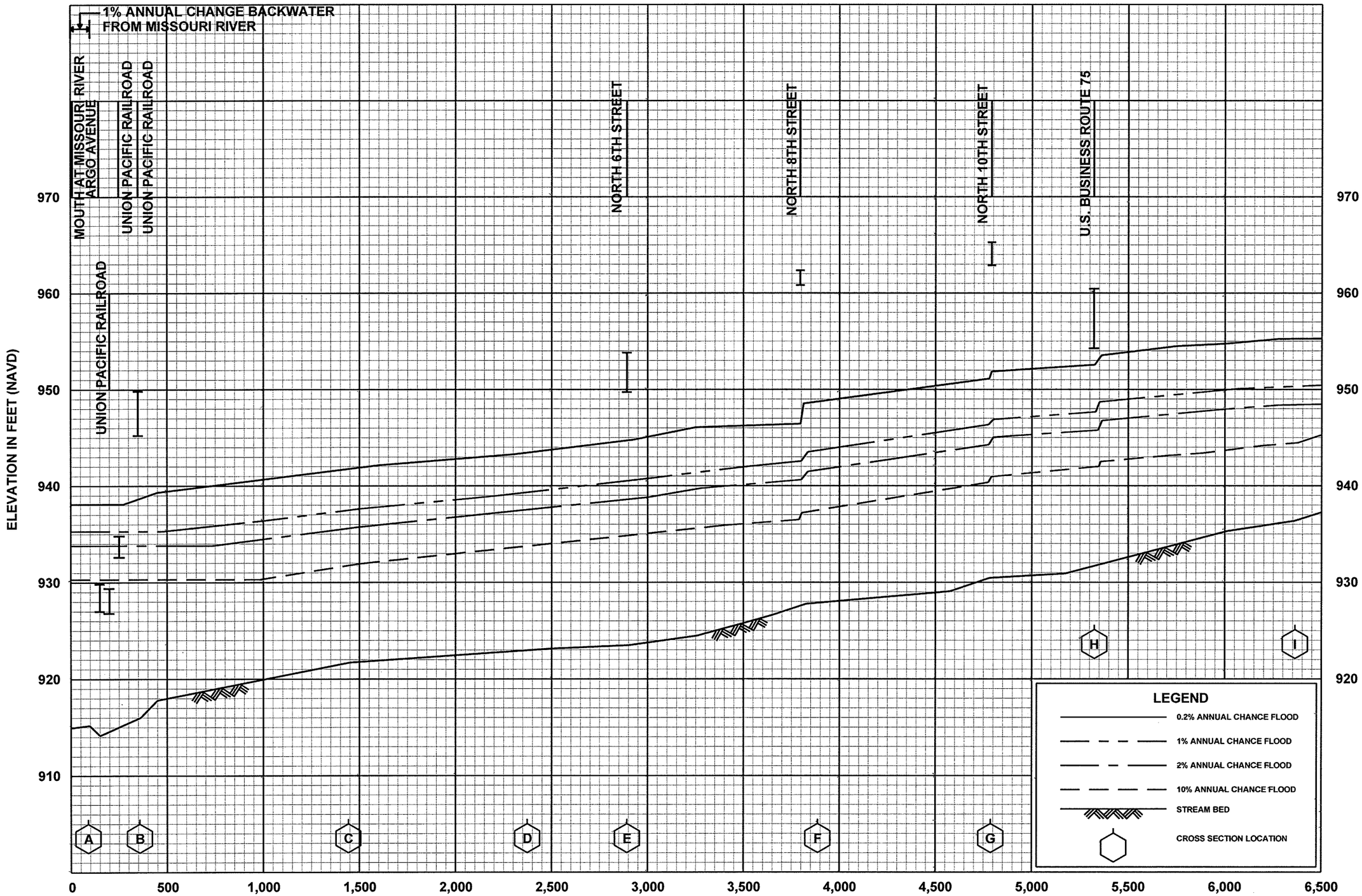
FLOOD PROFILES

MISSOURI RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE
AND INCORPORATED AREAS

07P



FLOOD PROFILES

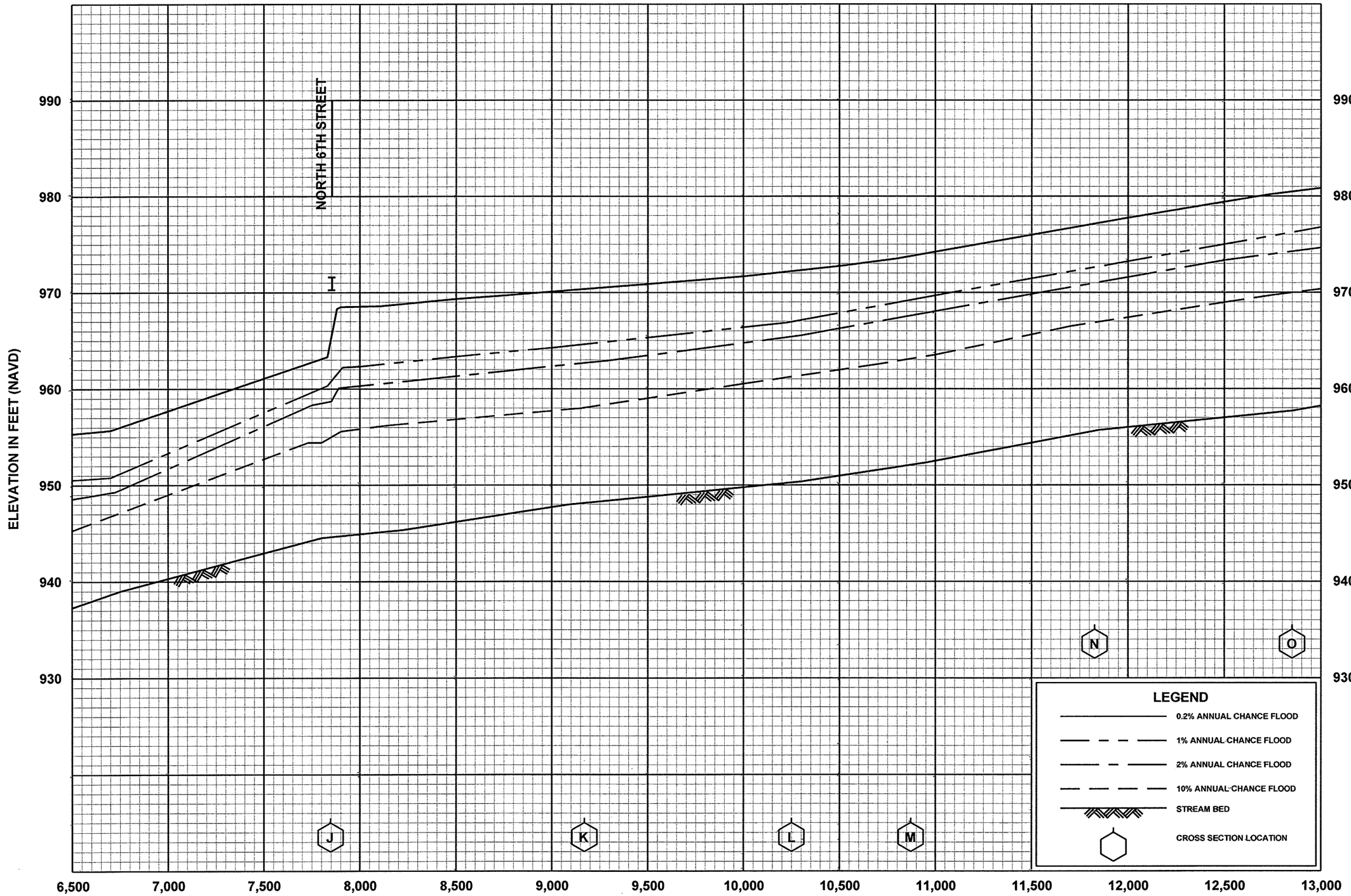
NORTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

08P



FLOOD PROFILES

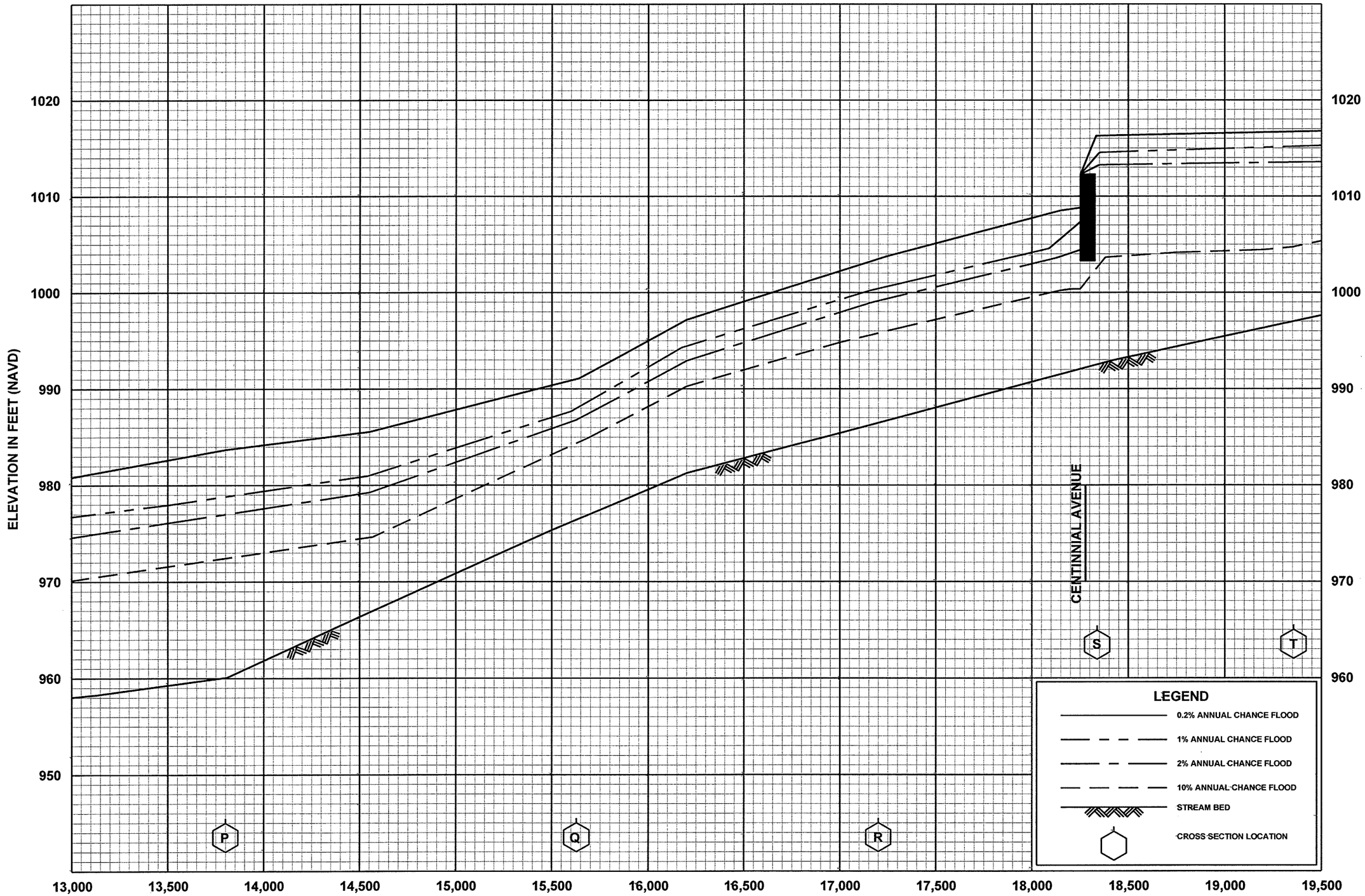
NORTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

09P



FLOOD PROFILES

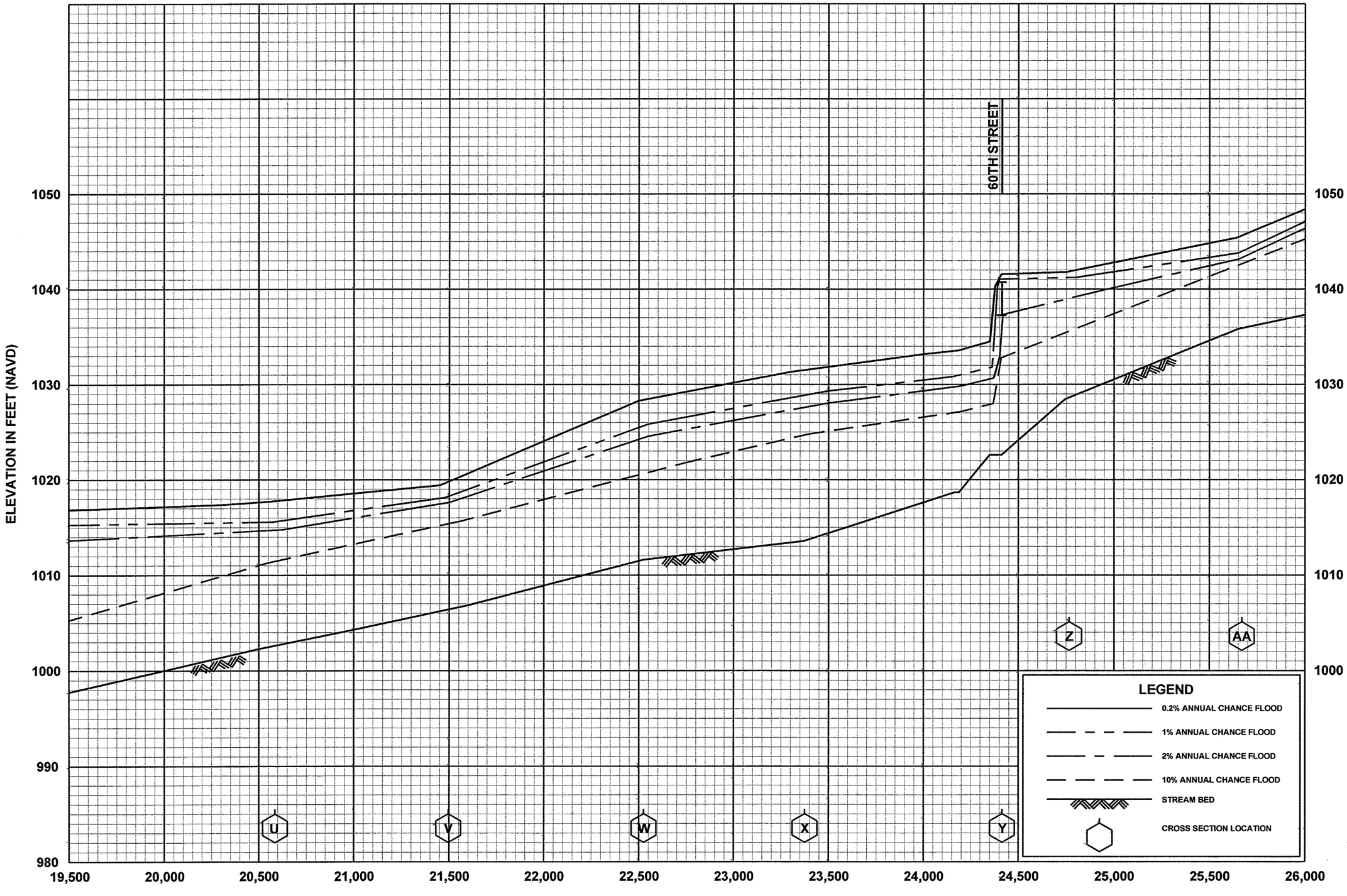
NORTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

10P



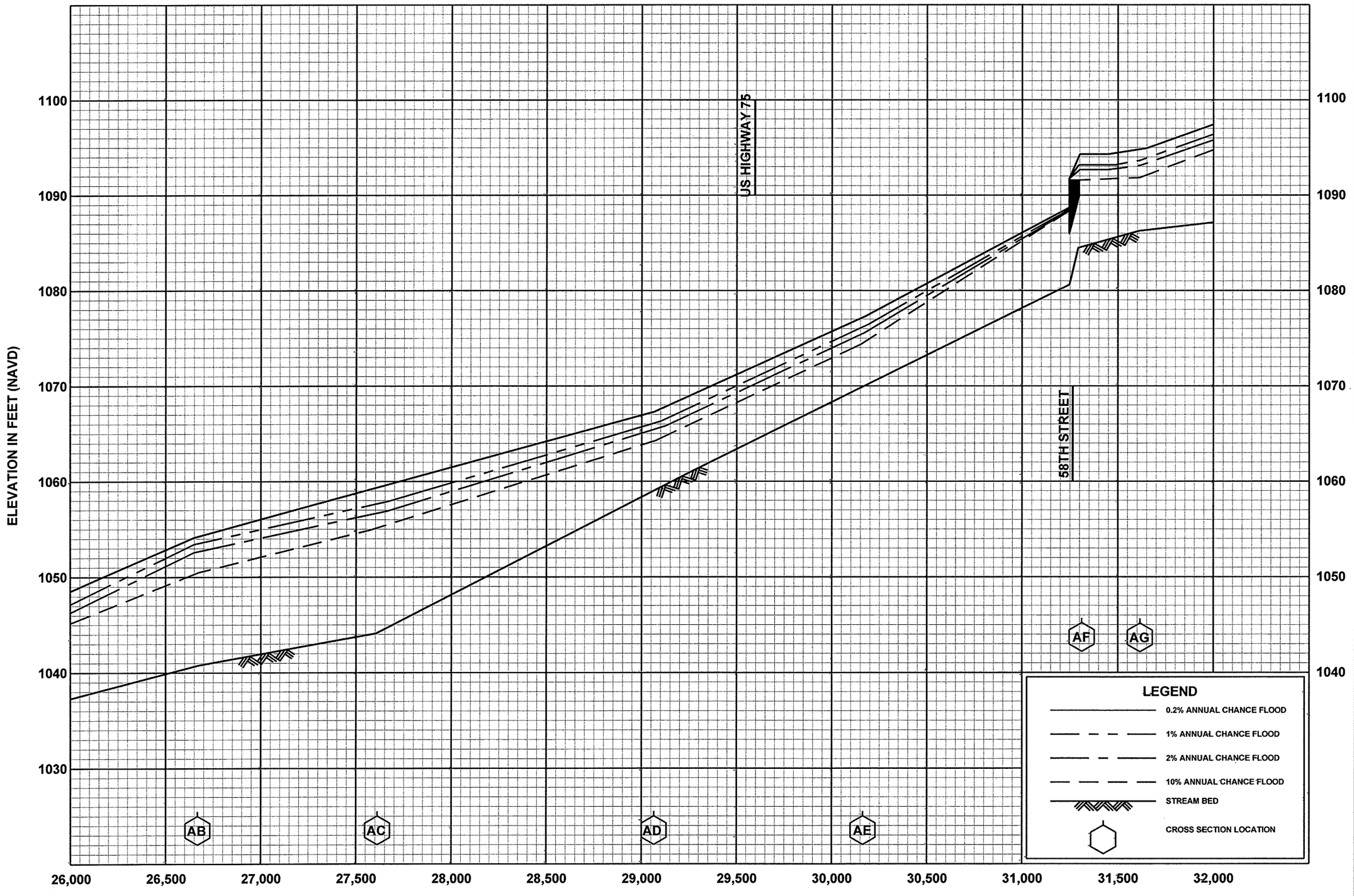
FLOOD PROFILES

NORTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS



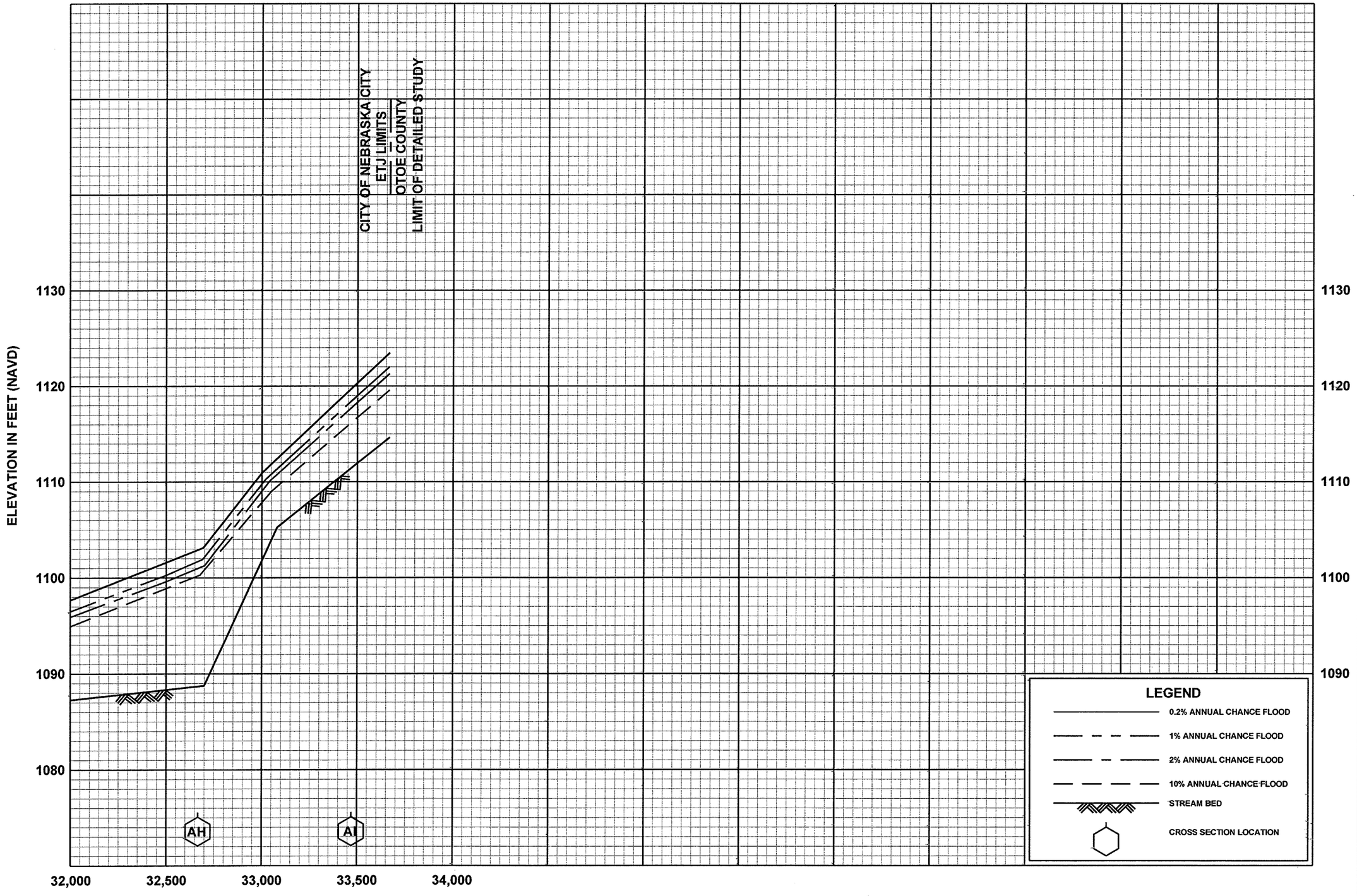
FLOOD PROFILES

NORTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS



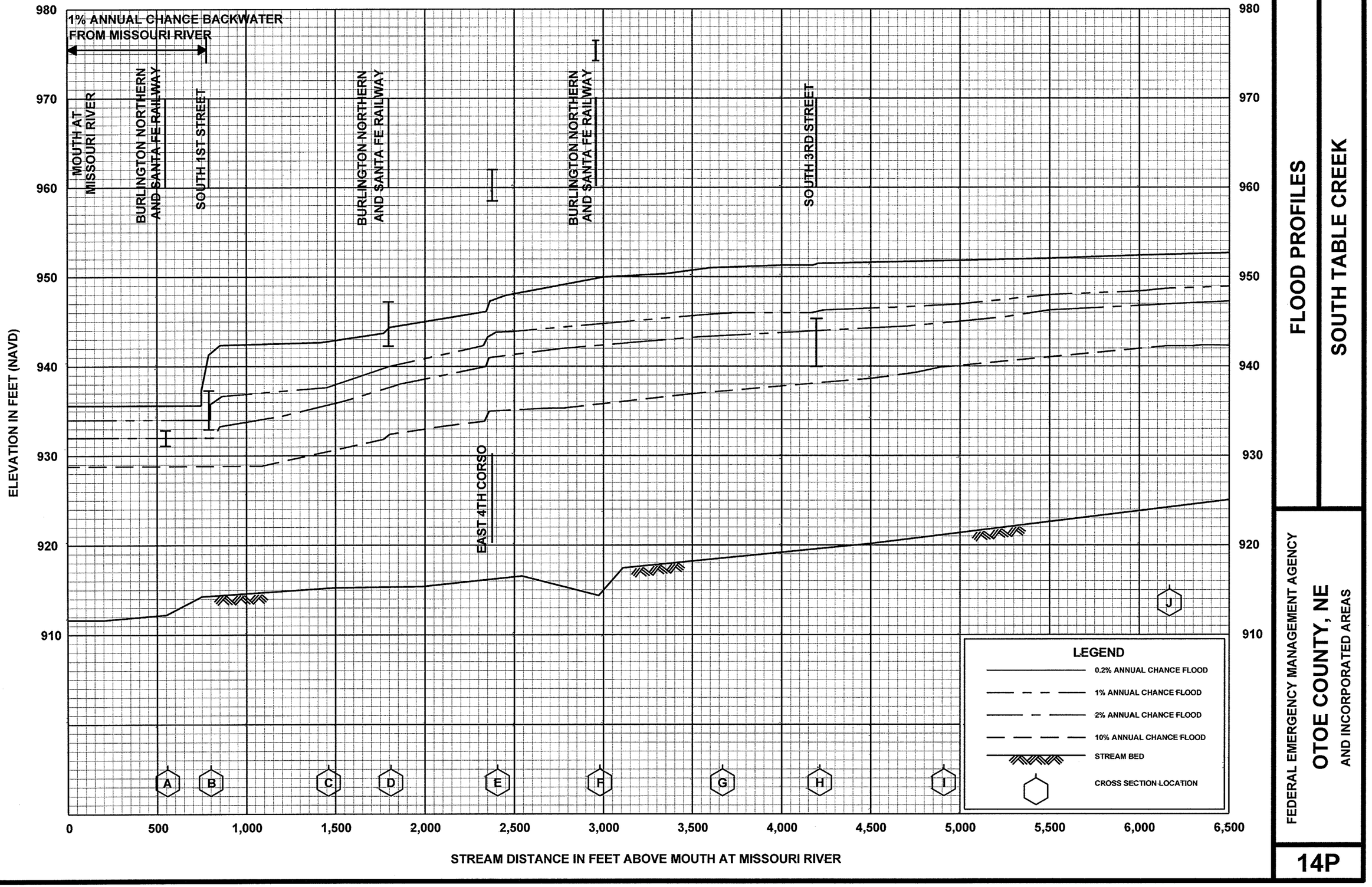
FLOOD PROFILES

NORTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS



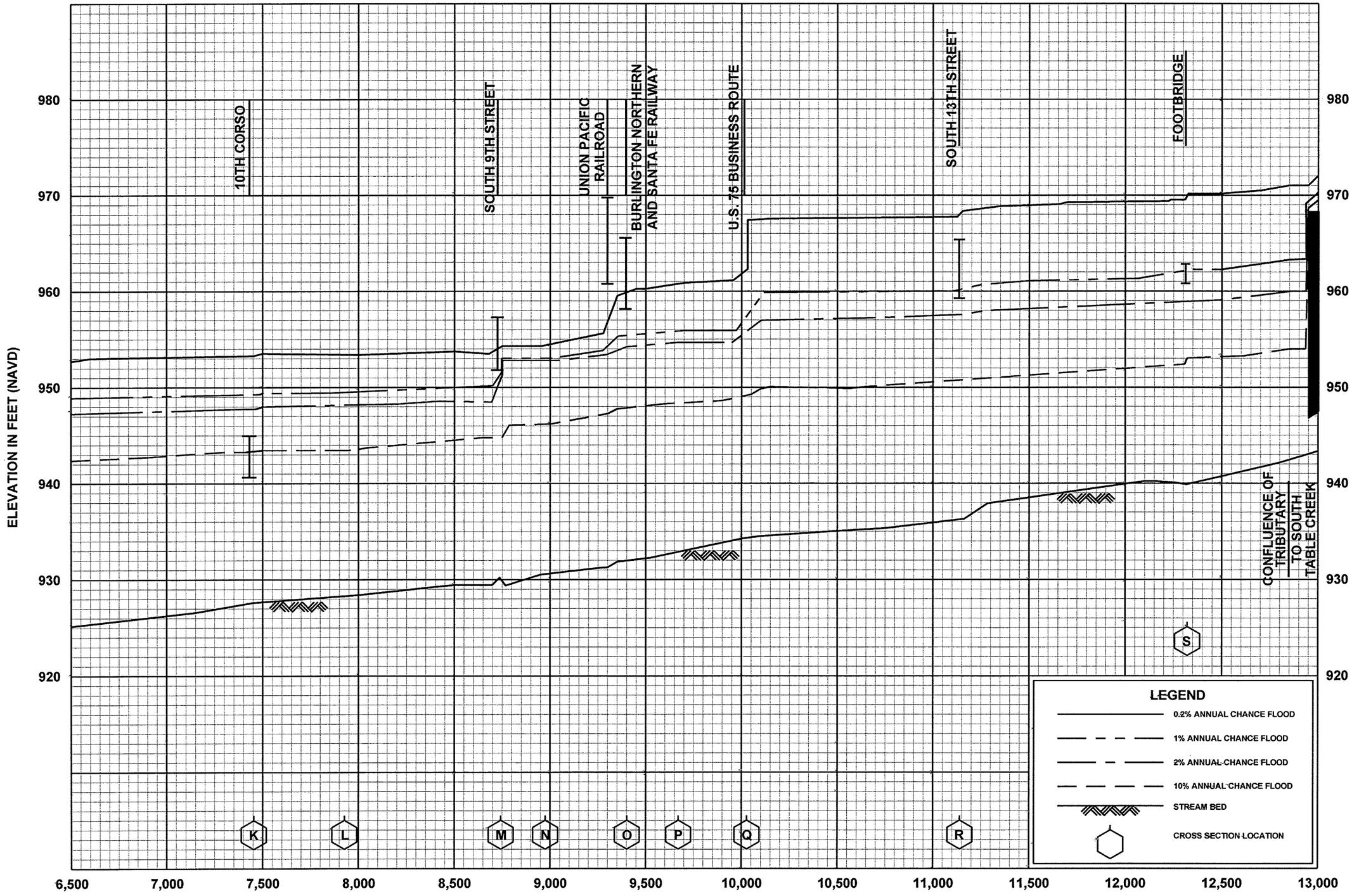
FLOOD PROFILES

SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS



FLOOD PROFILES

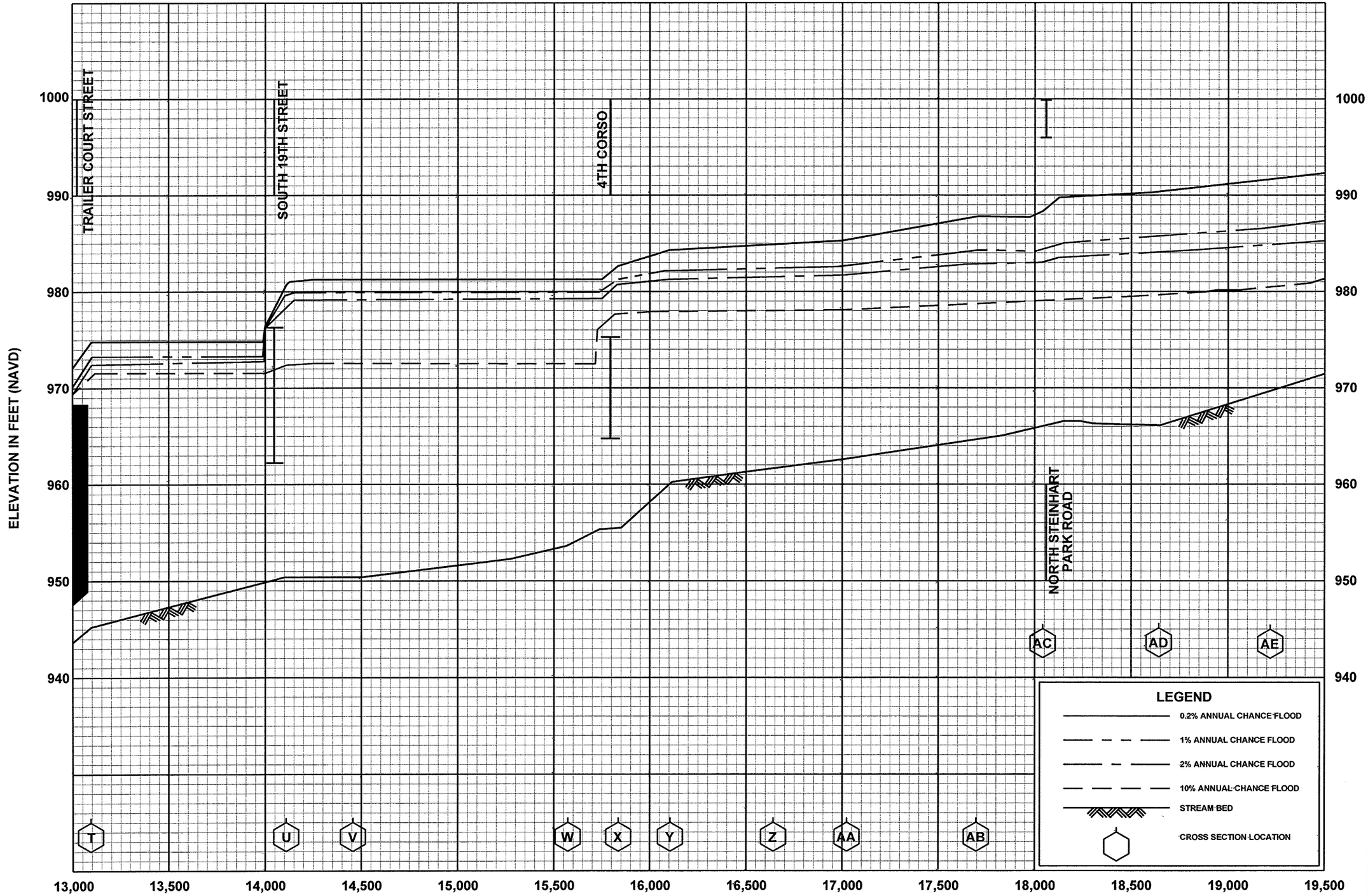
SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

15P



FLOOD PROFILES

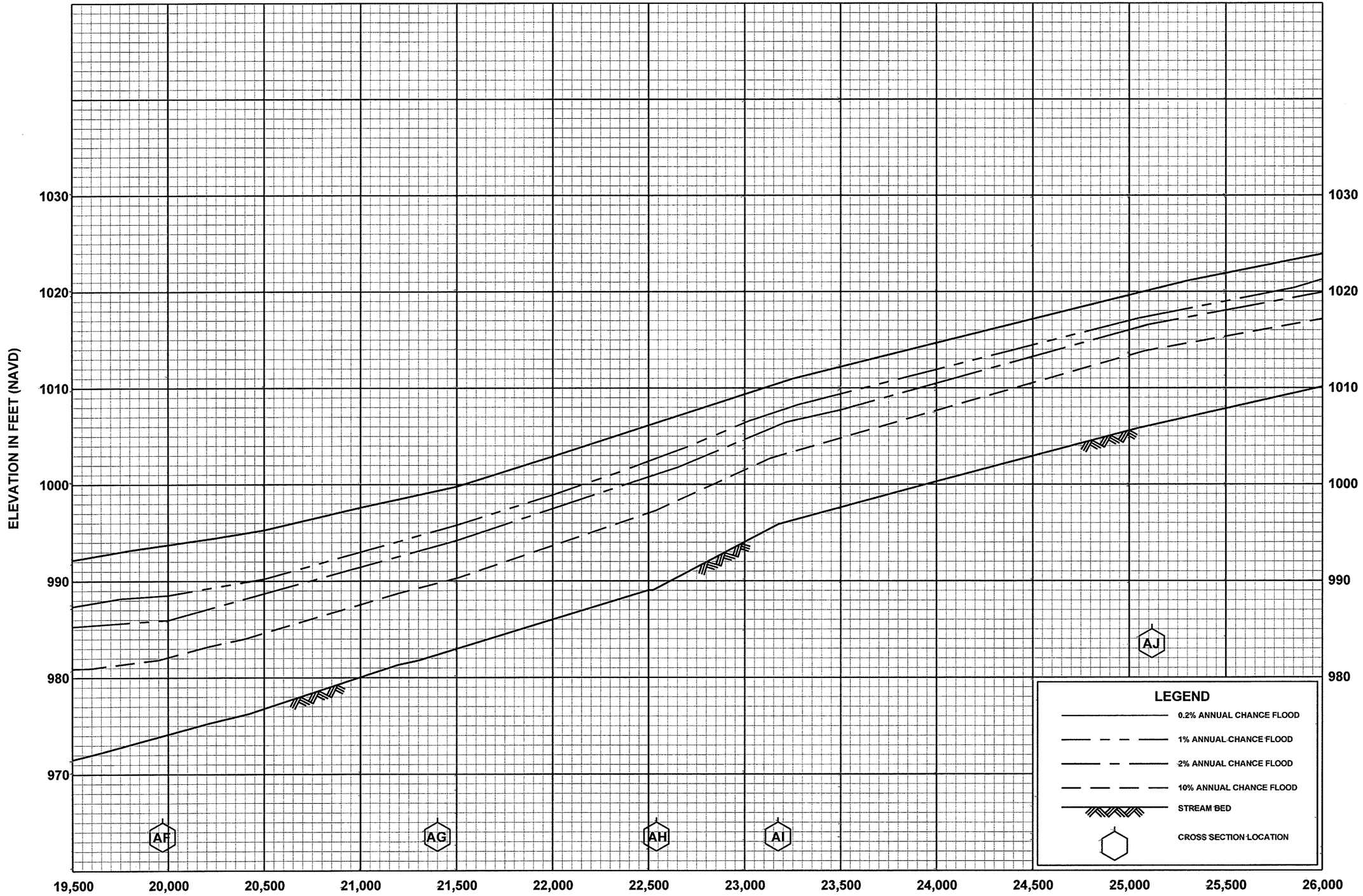
SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

16P



FLOOD PROFILES

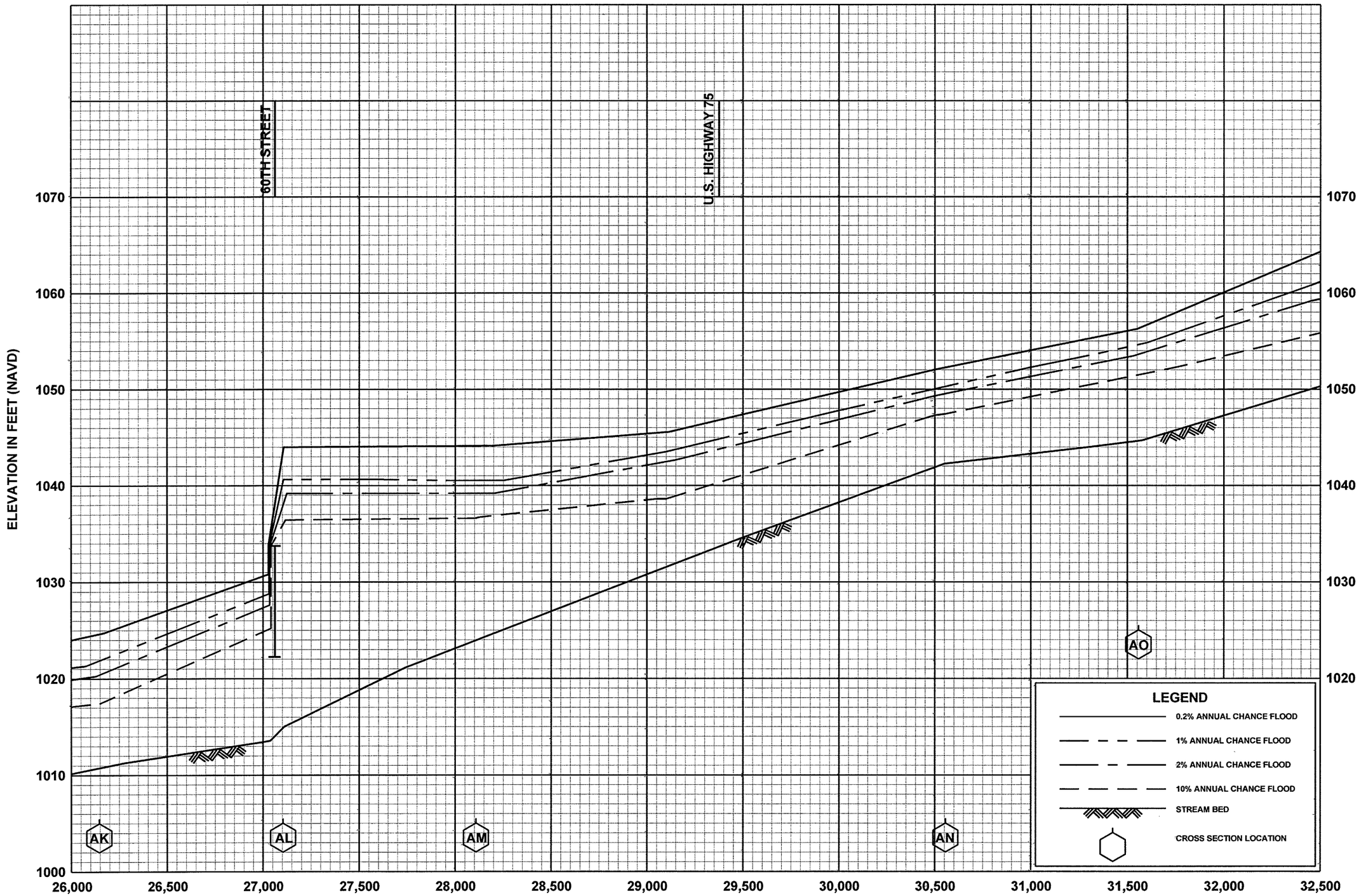
SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

17P



FLOOD PROFILES

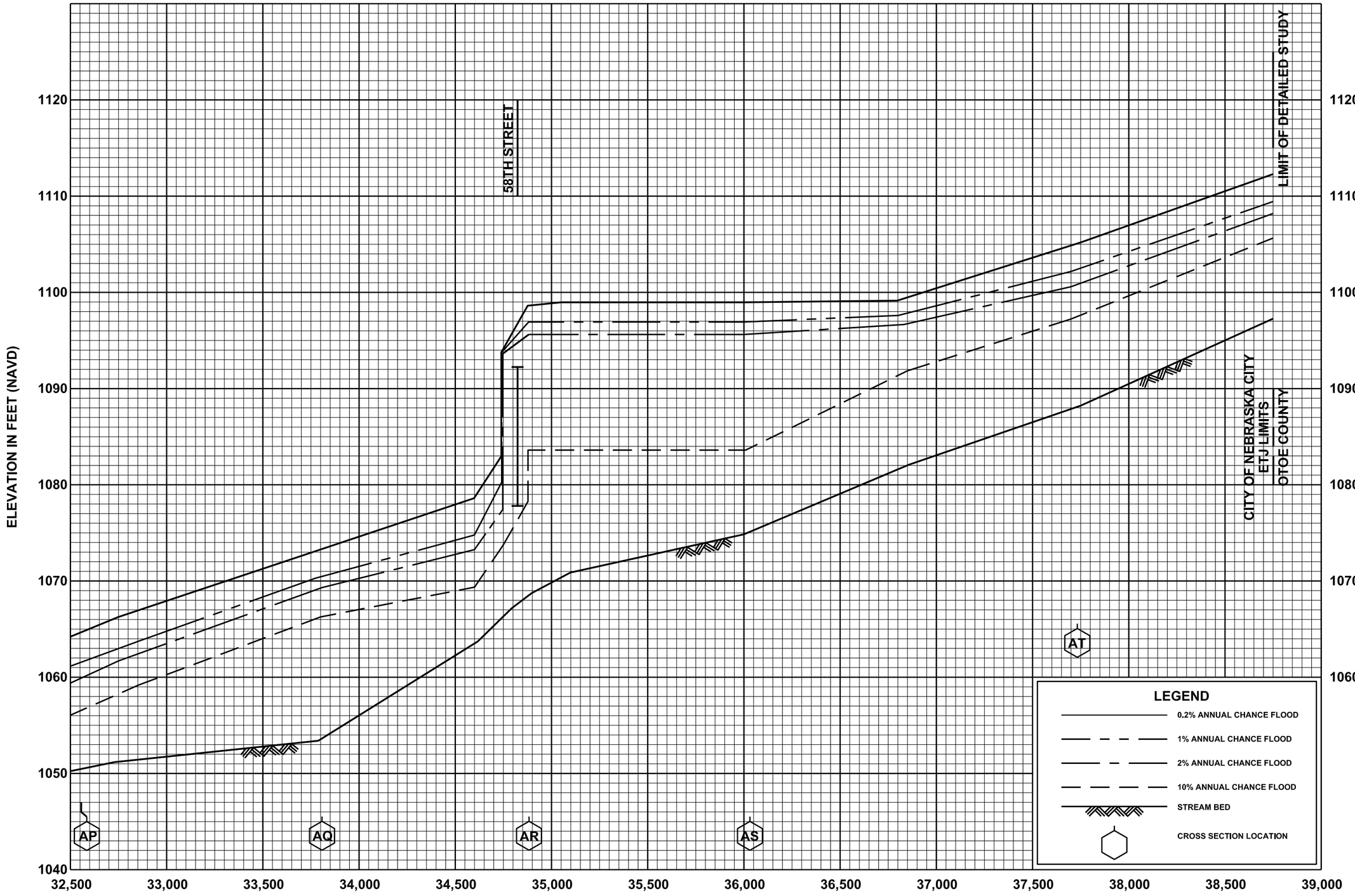
SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

18P



FLOOD PROFILES

SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

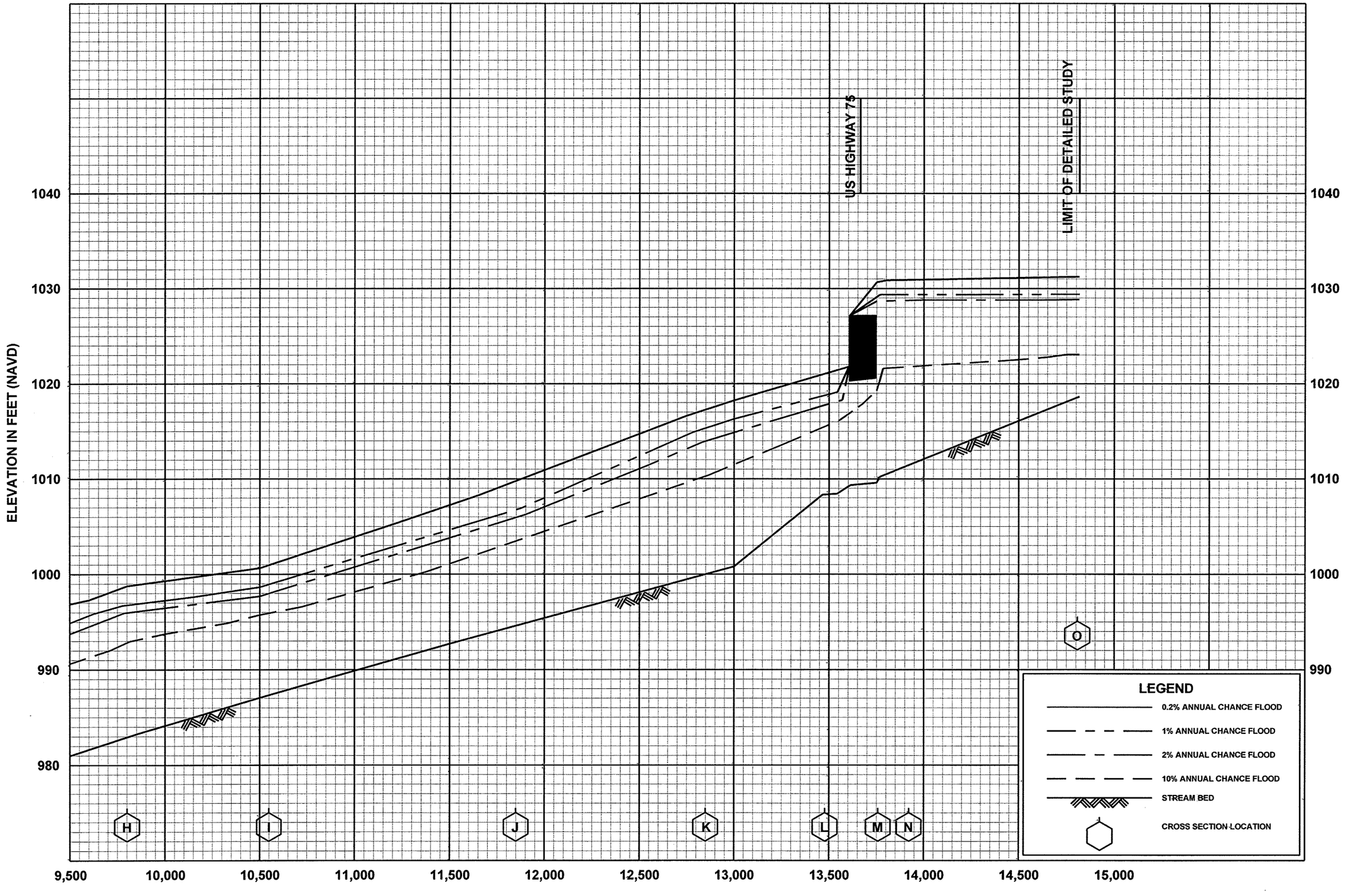
FLOOD PROFILES

THREEMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS



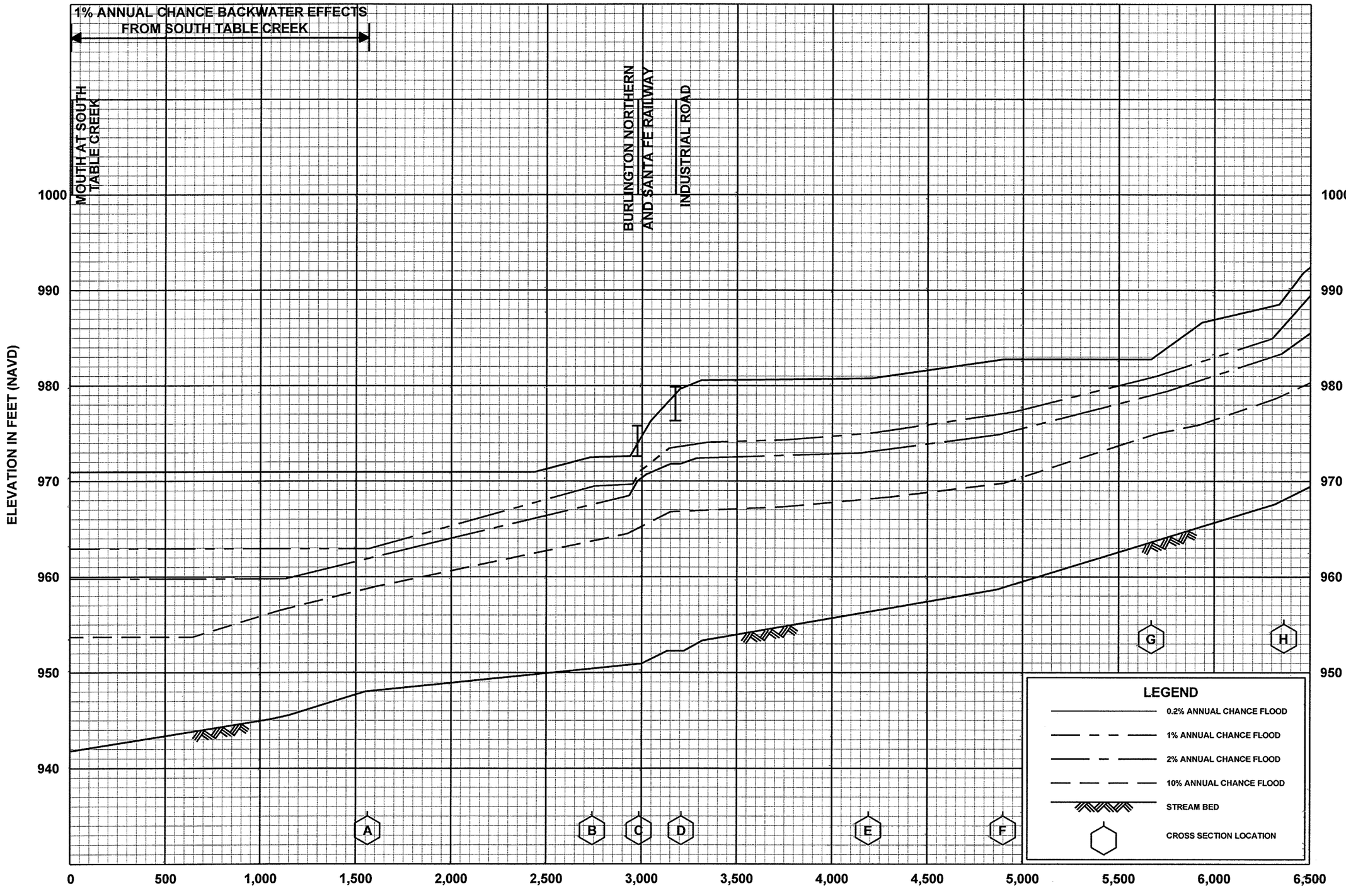
FLOOD PROFILES

THREEMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS



FLOOD PROFILES

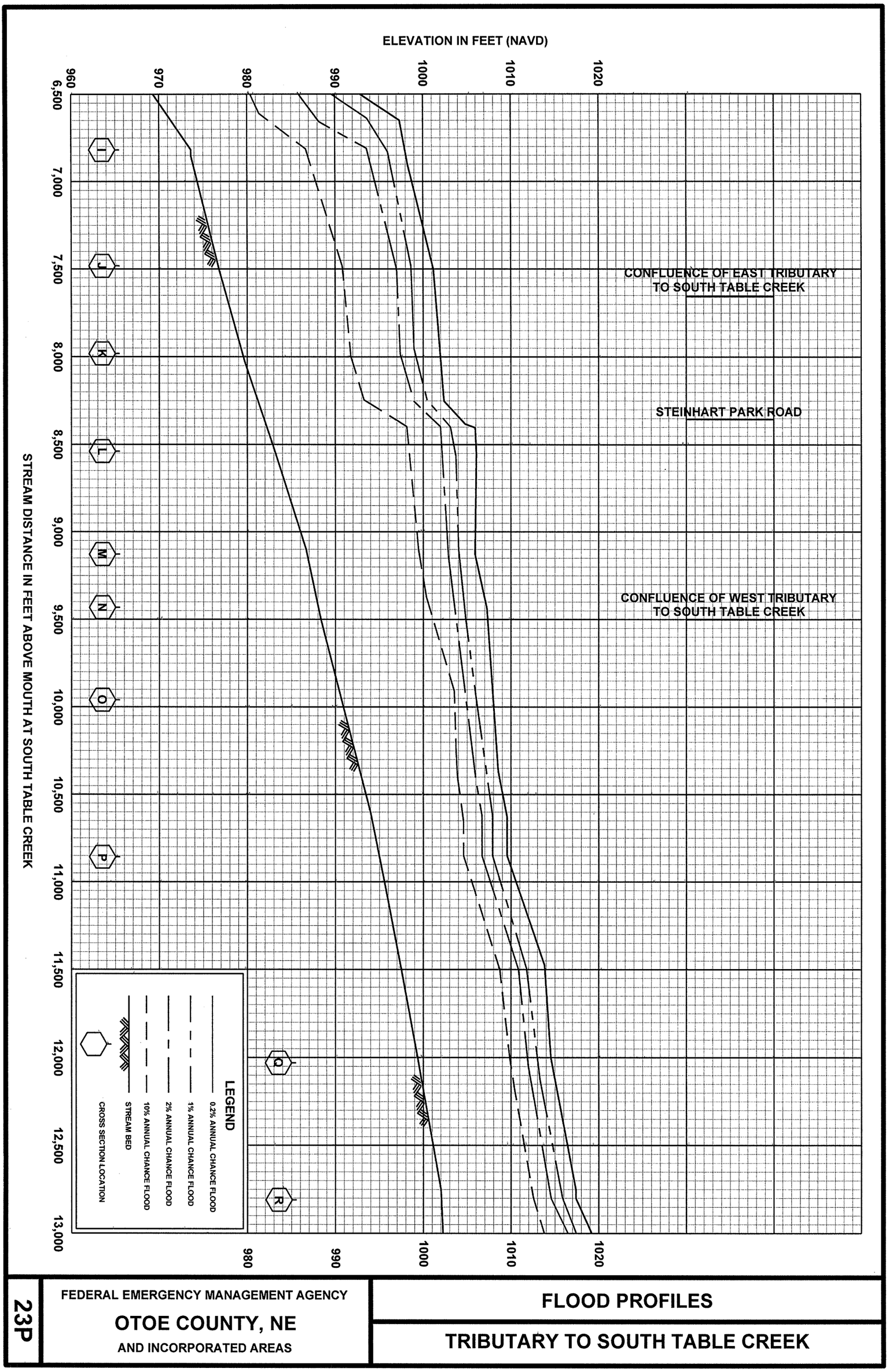
TRIBUTARY TO SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

22P



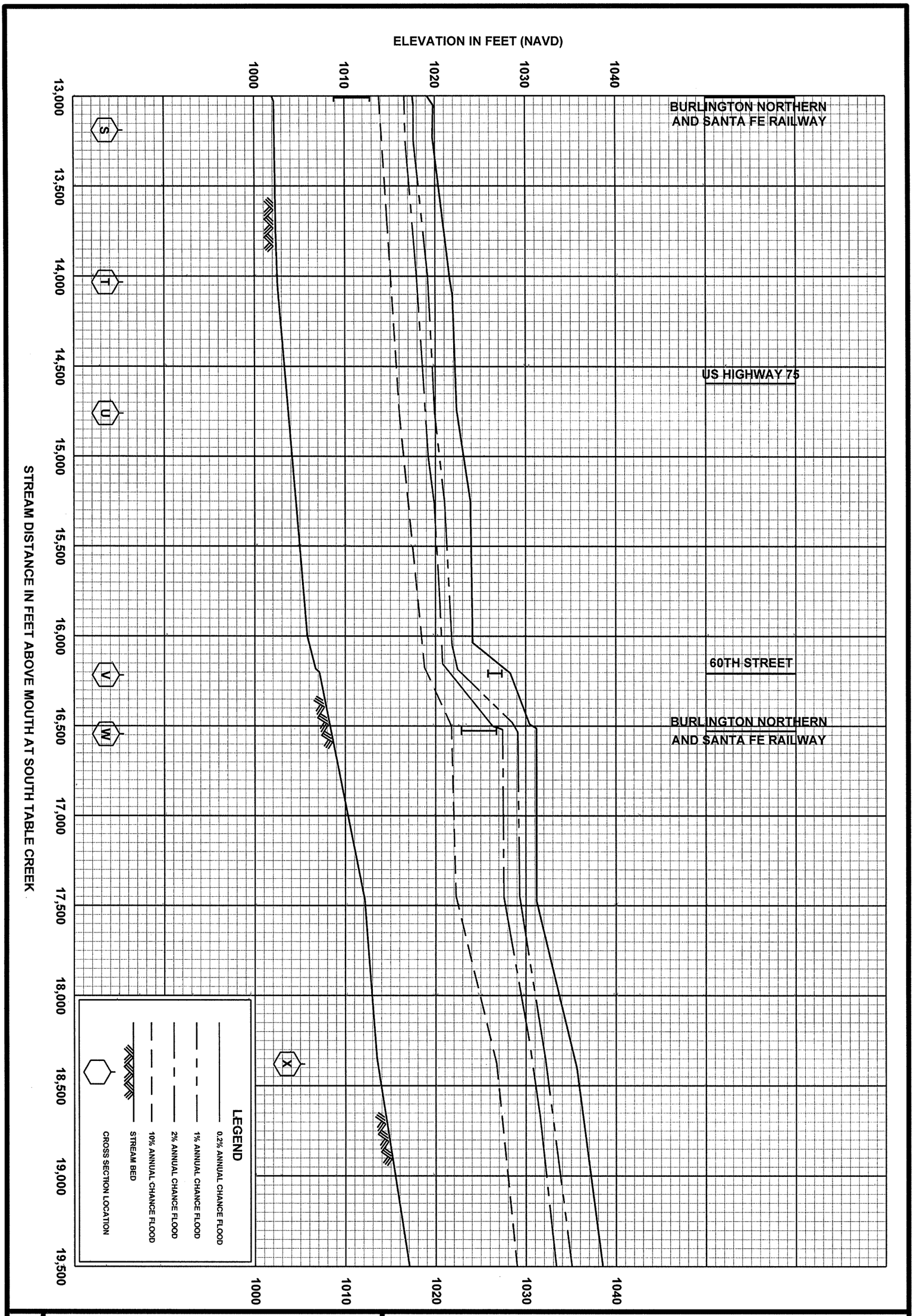
FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOOD PROFILES

TRIBUTARY TO SOUTH TABLE CREEK



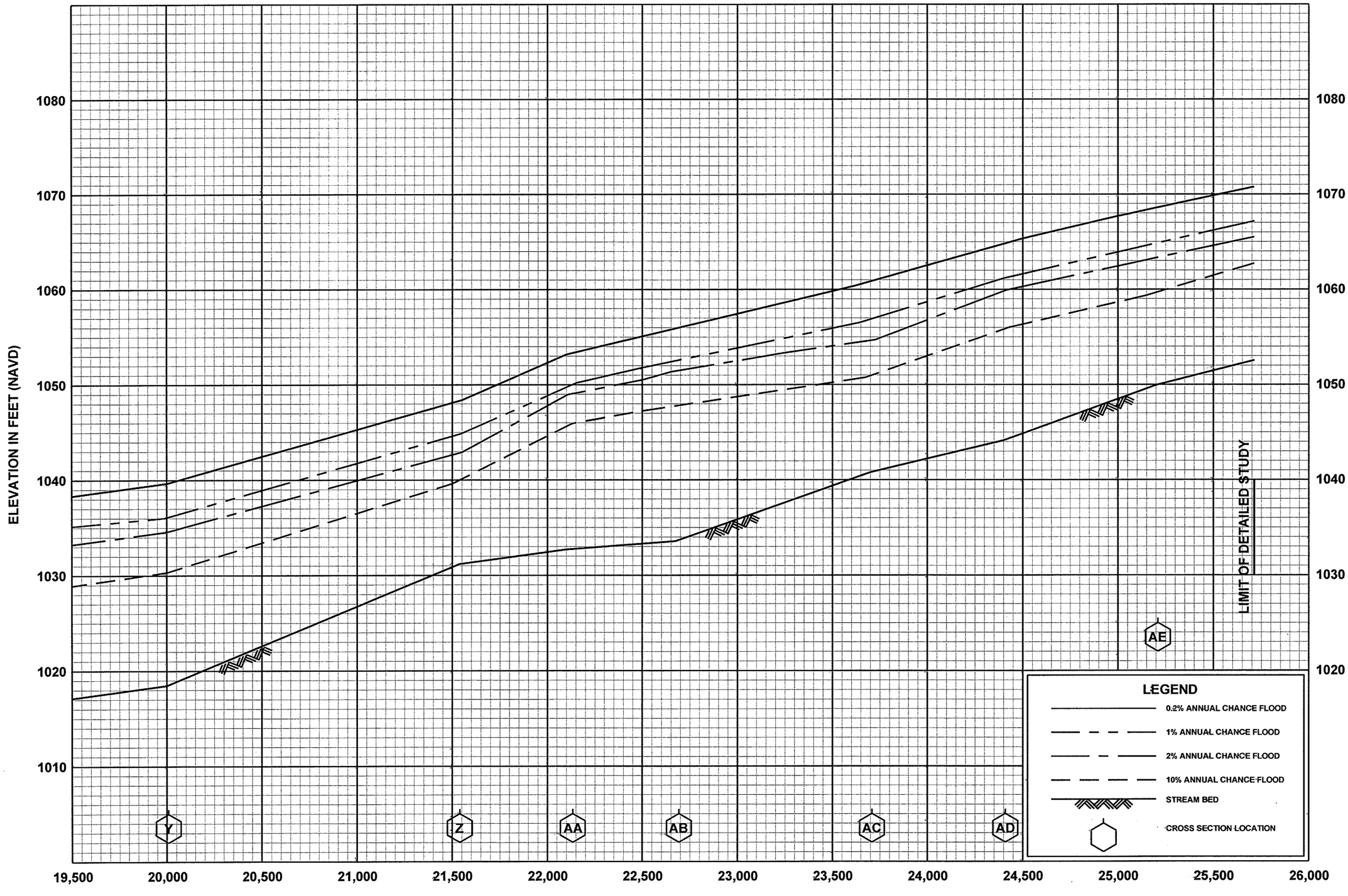
FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

FLOOD PROFILES

TRIBUTARY TO SOUTH TABLE CREEK



FLOOD PROFILES

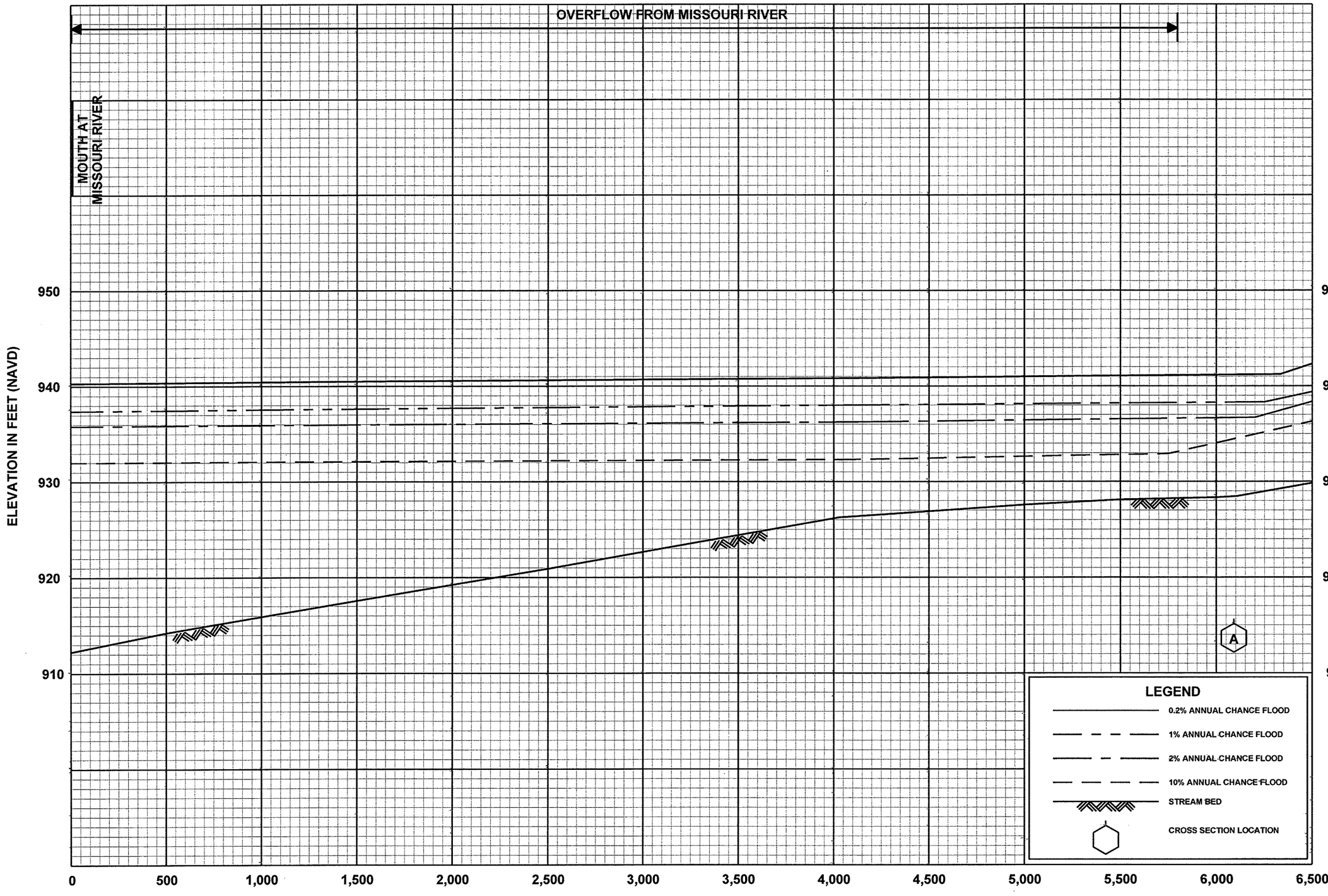
TRIBUTARY TO SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

25P



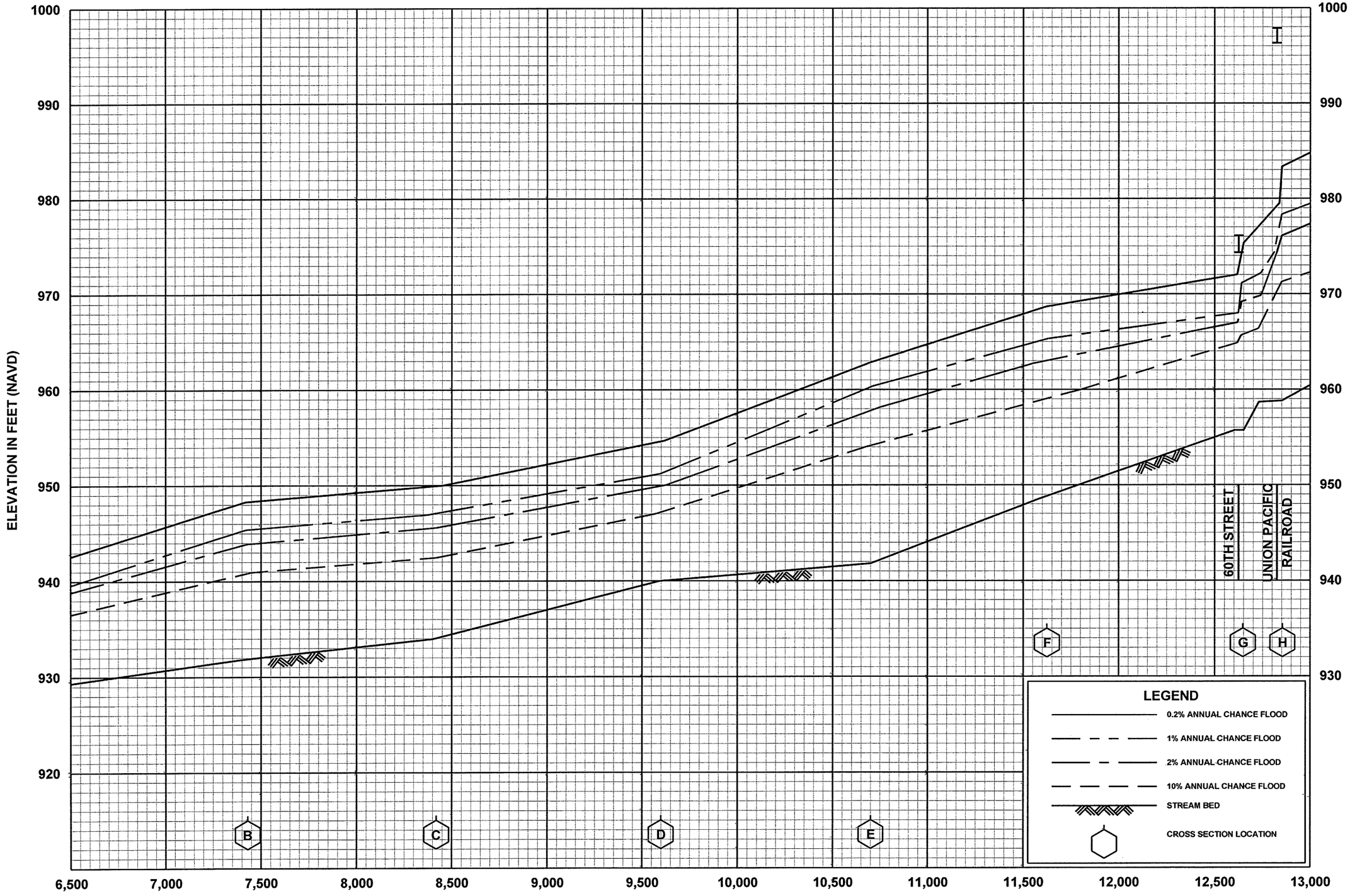
FLOOD PROFILES

WALNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS



FLOOD PROFILES

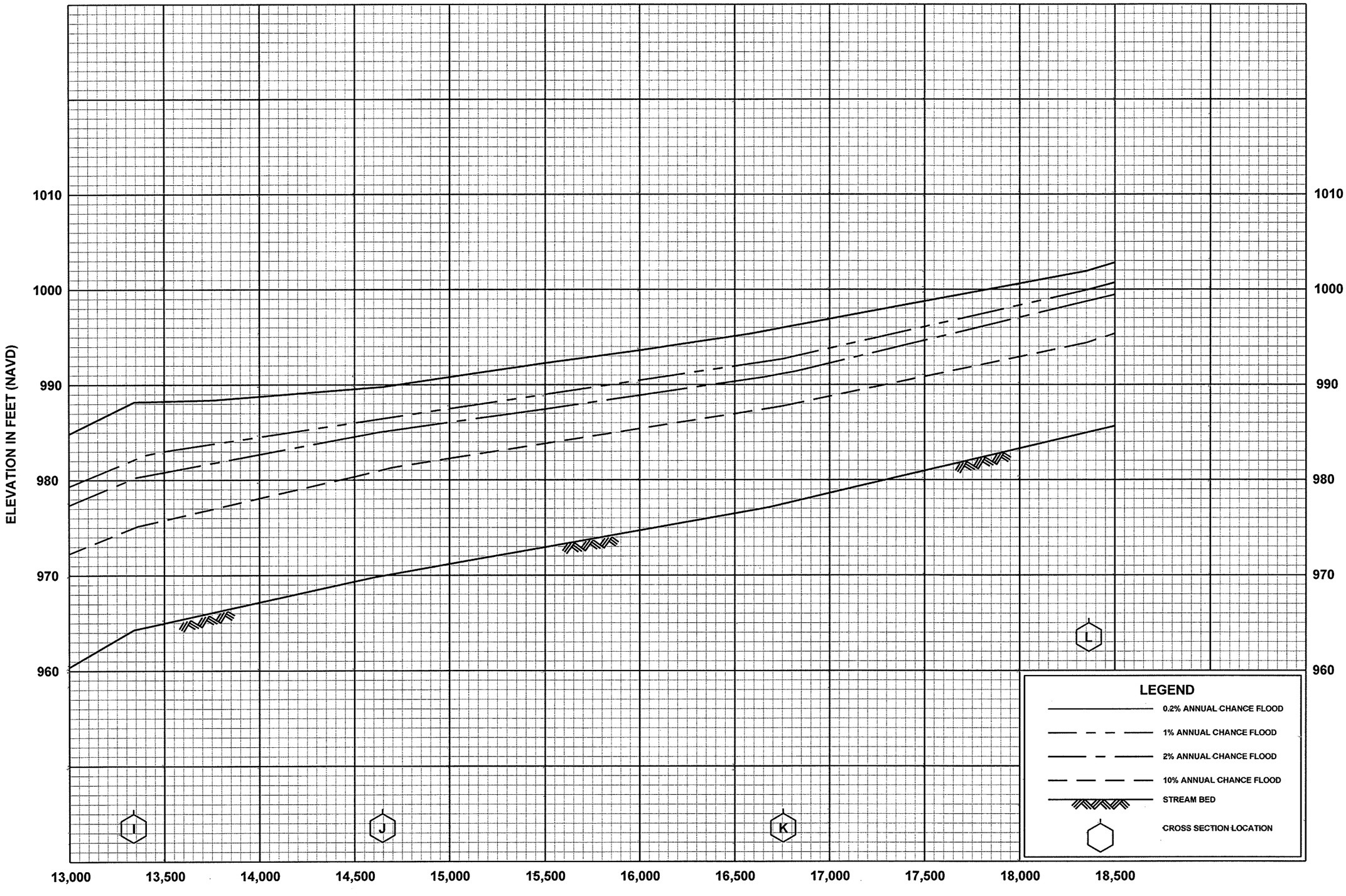
WALNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

27P



FLOOD PROFILES

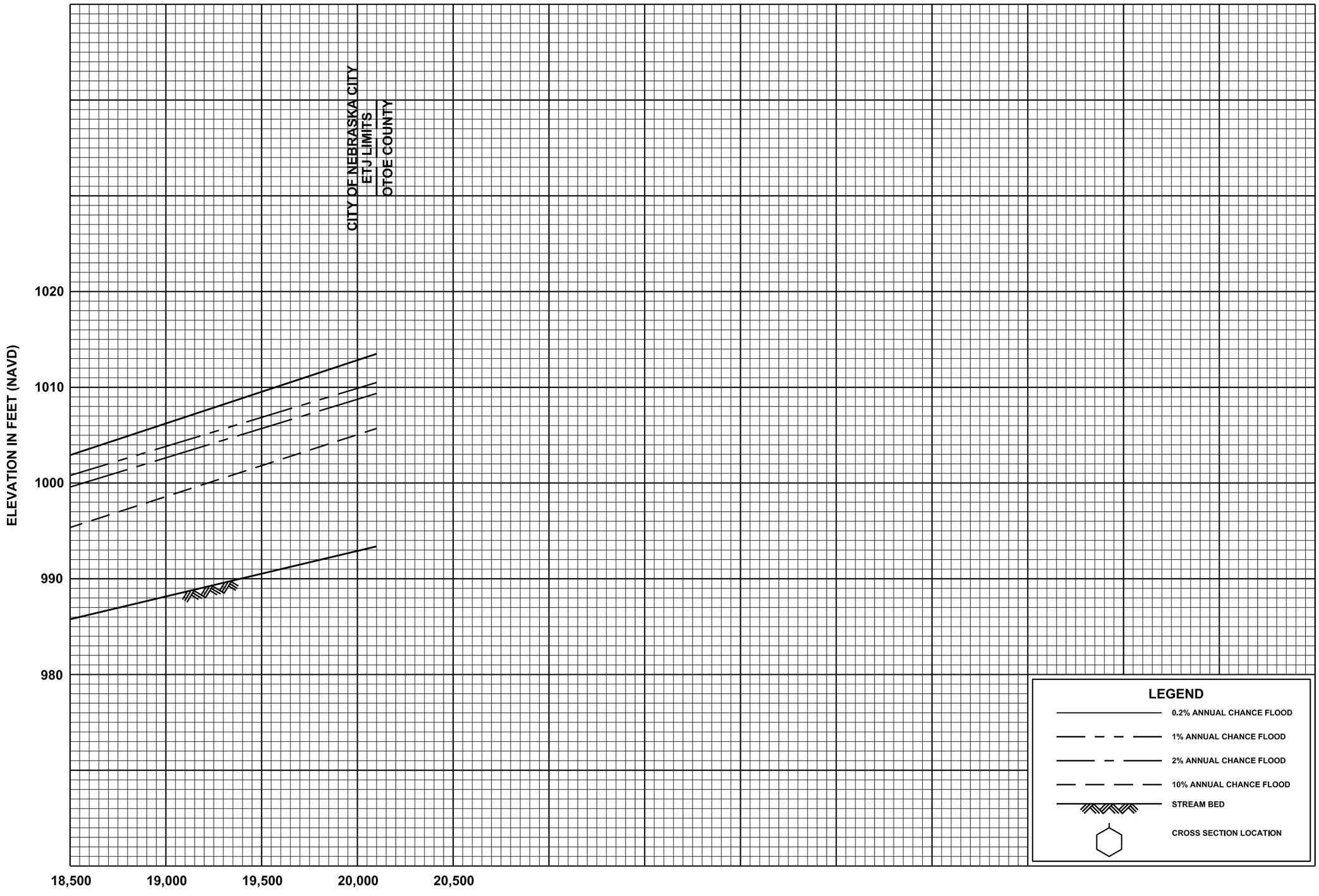
WALNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

28P



FLOOD PROFILES

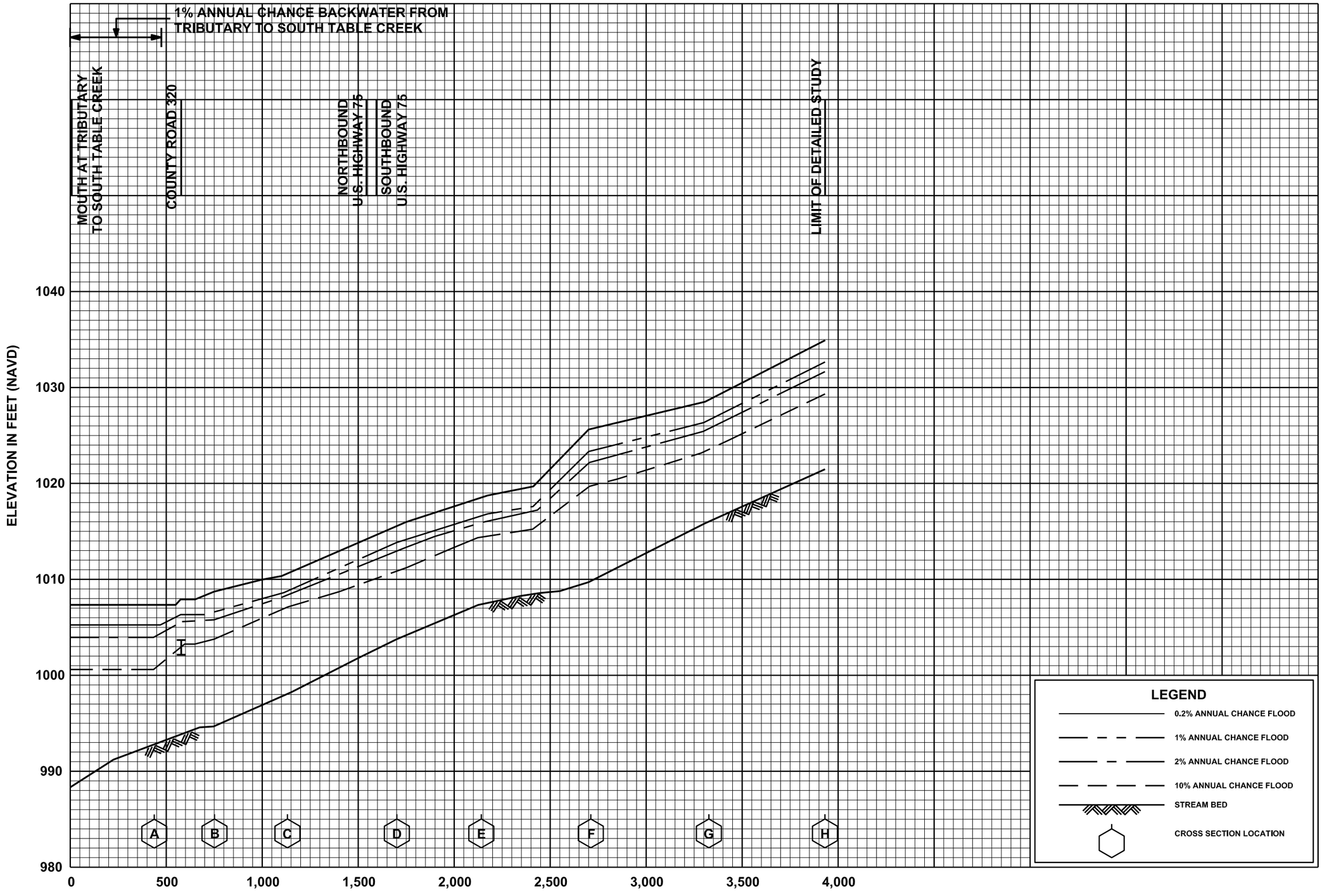
WALNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

29P



FLOOD PROFILES

WEST TRIBUTARY TO SOUTH TABLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

OTOE COUNTY, NE

AND INCORPORATED AREAS

30P